Series 1935, No. 14 Issued March 1940

Soil Survey

Albemarle County Virginia

By
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United States Department of Agriculture
and
EDWARD SHULKCUM
Virginia Agricultural Experiment Station

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PLANT INDUSTRY

In cooperation with the
Virginia Agricultural Experiment Station

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SOIL SURVEY OF ALBEMARLE COUNTY, VIRGINIA

By R. E. DEVEREUX, in Charge, and B. H. WILLIAMS, Soil Survey Division,[1] Bureau of Chemistry and Soils, United States Department of Agriculture, and EDWARD SHULKCUM, Virginia Agricultural Experiment Station

Area inspected by W. E. Hearn, Inspector, District 2

United States Department of Agriculture, in cooperation with the Virginia Agricultural Experiment Station

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COUNTY SURVEYED

Albemarle County, Va., lies slightly northwest of the geographical center of the State. Charlottesville, the county seat and principal

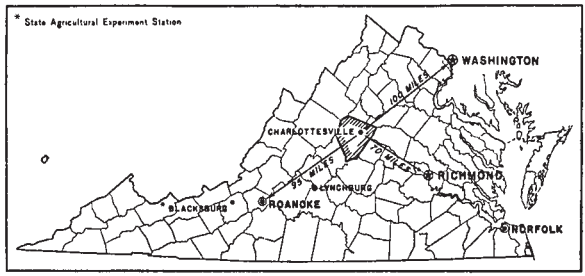

FIGURE 1.—Sketch map showing location of Albemarle County, Va.

city, is about 70 miles northwest of Richmond, 60 miles northeast of Lynchburg, and 100 miles southwest of Washington, D. C. (fig. 1).

The county is somewhat triangular in shape. The James River forms the extreme southern boundary or apex of the triangle, and

[1] The Soil Survey Division was transferred to the Bureau of Plant Industry July 1, 1939.

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the Blue Ridge forms the northwestern boundary, which is, therefore, somewhat irregular in outline. The maximum distance from north to south is about 39 miles, and the maximum distance from east to west, 21 miles. The total land area of the county is 735 square miles, or 470,400 acres.

Albemarle County embraces a part of two important physiographic divisions—the Piedmont Plateau and the Blue Ridge. The greater part of the county is within the Piedmont Plateau and consists of a broad plainlike surface, thoroughly dissected by numerous small streams, which generally flow in narrow winding valleys in a southeasterly direction, thus giving this section a rolling to hilly relief. The eastern part of the county is crossed in a northeast-southwest direction by a more or less continuous ridge, which in places has an altitude of more than 1,100 feet. This ridge begins in the southwestern corner of the county at a point on the Rockfish River 5 miles south of Damon, and is known as Green Mountain to the point where it is cut by the Hardware River, Carter Mountain from that point to the Rivanna River, and the Southwestern Mountains past the Orange County line. Green Mountain, Carter Mountain, and the Southwestern Mountains are underlain by a dark-colored basic rock, greenstone. Between the Southwestern Mountains and the Blue Ridge in the northwestern part are several isolated hills with steep slopes and narrow stony tops, locally called mountains. Beginning at a point southwest of Charlottesville is a series of low hills, a double range known as the Ragged Mountains, which, as they extend out of the county in a southwesterly direction, are locally called Fan Mountains. The higher points on these ranges reach an elevation of about 2,500 feet. They are composed mainly of granites and gneisses and have weathered so unequally that many narrow ridges and sharp peaks have been formed with numerous V-shaped coves between the steep slopes.

The northwestern part of the county includes the Blue Ridge and its eastern slopes. This ridge extends in a northeast-southwest direction and reaches an elevation of a little more than 3,200 feet at Loft Mountain in the northwestern corner of the county. The relief of this section is characterized by the relatively broad rounded ridge that forms part of the northwestern county line. The eastern slope is steep to almost precipitous in places and includes spurs and sharp knobs that stand out above the lower-lying piedmont hills, which it joins. Here, drainage is thorough through small rapid-flowing streams, which have cut narrow V-shaped valleys far up the slopes almost to the main ridge itself. These streams find their way into the Moormans River and the North and South Forks of the Rivanna River, which flow in a southeasterly direction across the piedmont section of the county, join to form the Rivanna River, and eventually empty into the James River.

The most important and largest smooth upland area lies in the southeastern part of the county and includes the Bucks and Penn soils, which are developed from the weathered products of the Newark formation, consisting of red shales and sandstone. This level area is irregular in shape and has its beginning about 1 mile northeast of McCullough on the James River and extends in a northeasterly direction almost to the Hardware River and a line drawn due north of Scottsville. In places it is cut at right angles by several small streams, along the breaks of which the relief is hilly and steep in places.

The general elevation of the piedmont section ranges from less than 300 feet, where the James River leaves the county at Scottsville, to 800 feet, where the Piedmont Plateau joins the Blue Ridge, although some of the isolated hills reach an elevation of 1,000 feet. As mentioned previously, the Ragged Mountains attain elevations up to 2,500 feet in places, and the maximum elevation, 3,200 feet, is in the extreme northwestern part of the county near Loft Mountain.

Very little of the original forest cover, which consisted mainly of hardwoods, remains. Chestnut, which at one time was one of the predominant species on mountains and higher elevations, is practically extinct, owing to the ravages of the blight. The early settlers cut and burned the trees in order to cultivate the new land, and later the lumber industry took the better trees, leaving the less valuable species to furnish seed for reforesting. The principal grasses in the county at present are bluegrass, oatgrass (*Danthonia* sp.), and orchard grass.

The first settlers within the section now known as Albemarle County came about 1734, nearly a decade after Governor Spottswood and his followers drank a toast on the top of the Blue Ridge at Swift Run Gap. Thomas Jefferson wrote of his father: "He was the third or fourth settler, about the year 1737, of the part of the county in which I live." These first settlements were made while the county was still a part of Goochland and Hanover Counties. Immigrants, mainly Irish, came up the Shenandoah Valley, crossed the Blue Ridge at Woods Gap, now known as Jarman Gap, proceeded down the larger streams from the foot of the mountains, and met other immigrants ascending the South Anna, Rivanna, and Hardware Rivers. This other tide of immigrants came from the older eastern settlements in the State and were mainly Scotch, Scotch-Irish, and English. Many of the present inhabitants are descendants of the early settlers. The county was established in September 1744 and named after the Earl of Albemarle. By 1785 all sections of the county were occupied (*7*).[2]

According to the United States census of 1930, the total population of the county was 26,981, which excludes the people living in Charlottesville, an independent city and the county seat, with a population of 15,245. Of the total population of the county, 15,535 were classed as rural-farm and 11,446 as rural-nonfarm population. The average density of the rural population is 36.1 persons a square mile. The inhabitants are fairly well distributed throughout the piedmont belt of the county, with the exception that the section northwest of Scottsville, where the large areas of Nason and York soils occur, is not nearly so thickly populated. The Blue Ridge and Ragged Mountains are the most thinly settled parts of the county. The inhabitants in this section formerly concentrated mainly along the larger streams and in the coves that branch off from these streams. A large area of the Blue Ridge section has been taken to form the Shenandoah National Park, and the few scattered residents have been moved out. The densest settlement is in and around the larger towns.

Charlottesville is the seat of the University of Virginia, and the original homes of Thomas Jefferson and James Monroe, Monticello and Ash Lawn, are only a few miles southeast of this city. Char-

[2] Italic numbers in parentheses refer to Literature Cited, p. 54.

lottesville is the principal local market and distributing center. The only two creameries in the county are located there, and the city furnishes an easily accessible market for most of the dairy products of the county. Other industries in Charlottesville include silk, woolen, and cotton textile factories, a large publishing and printing company, and shops of the Southern Railway system, which employ a fairly large number of men. Crozet, a small town located on the Chesapeake & Ohio Railway 12 miles west of Charlottesville, in the heart of the peach section, is the principal shipping point for peaches and apples. A large storage plant and a large packing plant are located in Crozet. Scottsville, on the James River, in the extreme southeastern part of the county, is an important trading and shipping point for that section. Before the days of railroads, Scottsville became a very important trading center, owing to its strategic location on the James River Canal. This canal was later abandoned and a branch of the Chesapeake & Ohio Railway laid on its towpath. Ivy Depot, Keswick, and Cobham, along the Chesapeake & Ohio Railway, and Covesville and North Garden, along the Southern Railway, are local trading and shipping points.

Railroad transportation facilities are very good and provide easy access to outside markets for practically every section of the county. Very few places are more than 12 miles from a railroad. A main line of the Southern Railway from Lynchburg enters the southwestern part, passes through Covesville and Charlottesville, and traverses a northeasterly course from this point across the county. The main line of the Chesapeake & Ohio Railway passes approximately through the center in an east-west direction. The southern and southeastern parts are served by another branch of the Chesapeake & Ohio.

United States Highways Nos. 29 and 250, passing through Charlottesville, and excellent State paved highways radiating in all directions from that city, serve practically every important rural community. These highways are supplemented by a good system of county roads, which are now under the supervision of the State Highway Department and kept in good repair the year around. Many of them have already been surfaced with sand, clay, and gravel, and others are in the process of being surfaced. Therefore, practically every section has a good outlet to one or more of the county's paved highways. Nearly all of the rural communities have telephone service, and rural mail routes cover all parts of the county where they are most needed. Rural electrification is available in many parts.

Schools and churches are located in convenient places throughout the county, a number of consolidated schools are accessible to all of the large communities, and busses are furnished by the county to transport the pupils to and from schools.

Most of the valuable merchantable timber has already been cut, but many small mills are in operation in various parts of the county, many of them having renewed operation during the last 3 years. A fairly large planing mill is in Charlottesville.

The mineral resources (*1*, *2*, *3*, *4*, *6*) include copper, iron, lead, and zinc, all of which have been mined in the county in the past. A soapstone mine is in operation in the southern part at Esmont. Slate, crystalline limestone, marble, and sandstone have also been quarried in the county. Brick clays occur in the vicinity of Keswick and Charlottesville and elsewhere.

CLIMATE

The mean annual precipitation is 44.61 inches, which is very evenly distributed throughout the year. June, July, and August have a mean rainfall of 14.74 inches and represent the wettest season. September, October, and November have a mean rainfall of 9.31 inches. November is the driest month of the year, with a mean rainfall of 2.46 inches. Violent storms are comparatively rare, and destructive droughts are uncommon. The average annual snowfall is 19.4 inches.

Though the growing season is too short for such crops as cotton and sugarcane, the rainfall and temperature are favorable for the production of a large variety of other crops, such as winter wheat, rye, oats, clover, and similar crops. Such fruits as apples, peaches, pears, and grapes do well under the prevailing climate. Native fruits include an abundance of blueberries, huckleberries, blackberries, and dewberries, along with some wild cherries, mulberries, papaws, and persimmons. Such hardy vegetables as kale, spinach, and turnips are grown on a small scale in the late fall and early spring.

Table 1, compiled from the records of the United States Weather Bureau station at Charlottesville, gives the normal monthly, seasonal, and annual temperature and precipitation, which is representative of practically all of the county with the exception of the higher mountainous parts.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Charlottesville, Albemarle County, Va.*

[Elevation, 854 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1930)	Total amount for the wettest year (1901)	Snow, average depth
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	38.3	74	−2	3.46	2.41	8.35	4.1
January	36.4	77	−3	3.35	2.62	2.74	5.1
February	37.4	79	−9	2.80	1.24	.90	6.4
Winter	37.4	79	−9	9.61	6.27	11.99	15.6
March	46.3	94	10	3.47	2.72	2.45	3.0
April	55.9	97	21	3.52	2.90	9.05	.4
May	65.7	97	35	3.96	1.66	7.66	.0
Spring	56.0	97	10	10.95	7.28	19.16	3.4
June	72.6	100	43	5.29	2.89	6.64	.0
July	76.5	102	49	4.33	.78	7.23	.0
August	74.8	105	50	5.12	2.30	12.91	.0
Summer	74.6	105	43	14.74	5.97	26.78	.0
September	69.5	97	37	3.22	1.76	4 62	.0
October	58.6	94	26	3.63	.57	.57	.0
November	47.9	81	14	2.46	1.81	2.17	.4
Fall	58.7	97	14	9.31	4.14	7.36	.4
Year	56.7	105	−9	44.61	23.66	65.29	19.4

The average length of the frost-free season is 210 days, from April 6, the average date of the latest killing frost, to November 2, the average date of the earliest. Frost has been recorded at Charlottesville as late as April 24 and as early as October 9. The dates of the early and late killing frosts on the higher areas of Ragged Mountains and the Blue Ridge are about 2 weeks later and earlier than in most of the lower piedmont section of the county. Between elevations of about 900 feet and 1,000 feet is a zone known as a thermal belt. This zone occurs in places along the slopes and foothills of the Blue Ridge and some of its detached ranges, particularly the Ragged Mountains and in the southeastern part of the county. In this zone vegetation is retarded in the spring until danger of killing frost has passed, and, as the freedom from frost at the time of bloom is a factor of prime importance in the successful production of fruit, such areas are greatly desired by apple growers, and many orchards are planted in this zone. On the other hand, elevations above 2,000 feet are much more subject to hailstorms and heavy snows, and, therefore, make the growing of fruit trees much more hazardous. At these higher elevations, however, the rainfall is somewhat heavier and the humidity higher. Since these conditions are conducive to the growing of grass, large areas on top of the Blue Ridge have been cleared and are used for pasture.

AGRICULTURAL HISTORY AND STATISTICS

Agriculture, which has been the main occupation of the inhabitants of Albemarle County from its earliest settlement shortly before 1737, was at first entirely self-sustaining. As most of the early settlers came up the James River and from there along the larger streams that traverse the section now included within the county, they naturally built their homes along these streams and cleared and farmed the fertile bottom lands. Many beautiful old colonial homes still stand in places along the Rivanna and Hardware Rivers, bearing testimony of the influence exerted upon the agriculture by these rich alluvial soils, which are still considered the richest soils in the county.

With the increase in number of settlers, all of the cultivable bottom land was taken up, and later more upland was cleared for cultivation. Tobacco soon became the main cash crop and was grown year after year on the same land. When the land was thought to be "worn out," new land was cleared and the old land allowed to become reforested. Tobacco was grown mainly for export to England, and was shipped by flatboats down the James River and marketed in Richmond. Scottsville, in the southeastern part of the county, was an important shipping point.

The ownership of a large number of slaves made tobacco growing profitable in the early period, but at the close of the War Between the States a transition in agricultural methods began. Corn, oats, and wheat remained the principal subsistence crops, but the growing of fruits, mainly apples, took the place of tobacco as a cash crop. Poultry products and farm animals also became important in the changed and more diversified system of farming.

According to the United States census of 1880, the number of farms was 2,099 with an average size of 202 acres. With respect to

acreage, the principal crops were corn, wheat, and oats. By this census fruits were valued at $53,239 and forest products at $66,466. Tobacco was still being grown in 1879, but in that year it had already greatly decreased in importance as a cash crop, only 3,216 acres being grown. By 1900 the acreage devoted to tobacco had been reduced to 1,031 acres, and it continued to be reduced until, in 1920, only a few acres were planted, and this to furnish home needs.

Corn still is the most widely grown crop. The acreage planted to corn has been fairly constant and has exceeded that planted to any other crop, except in 1919, when the acreage in hay and forage surpassed it. According to the United States census, 495,131 bushels were produced in 1934. It is used for feeding work animals, cattle, poultry, and hogs, and is ground into meal for home consumption. Hay, one of the important crops in acreage, has increased considerably in production. A considerable acreage of wheat is grown, but not enough to supply the local demands for flour. Some oats, rye, barley, soybeans, and cowpeas are grown as feed crops and soil improvers. The 1935 census shows a decided decrease in acreage planted to all crops, which was probably due to the aftermath of the World War, which brought inflated land values followed by deflation and lower prices for all farm products. The increase in hay and forage crops for the period was coincident with increases in livestock and poultry. These, with the introduction of commercial orchards, mainly apple and peach, constitute the principal changes in the agriculture of the county. In 1934 the production of apples was 578,337 bushels, which was exceeded only in Frederick and Augusta Counties, and the production of peaches was 191,635 bushels, which led the entire State.

Table 2, compiled from the reports of the United States census for the years 1880 to 1935, gives the acreages of the principal crops grown.

TABLE 2.—*Acreages of the principal crops grown in Albemarle County, Va., in stated years*

Crop	1879	1889 [1]	1899 [1]	1909	1919	1929 [1]	1934 [1]
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Corn	35,234	30,881	36,011	31,207	34,080	20,376	20,441
Wheat	25,806	13,642	16,359	8,800	18,545	7,773	6,787
Oats	17,483	15,257	9,451	8,610	4,940	1,396	1,531
Tobacco	3,216	917	1,031	411	93	3	2
Soybeans					22	3,175	1,689
Cowpeas						1,044	1,804
Hay and forage	[2] 8,691	[2] 18,326	15,638	17,824	42,905	20,759	24,256
	Trees	*Trees*	*Trees*	*Trees*	*Trees*	*Trees*	*Trees*
Apples		134,660	505,218	366,084	377,061	538,655	512,979
Peaches		11,300	110,465	80,048	118,212	177,362	194,025

[1] Number of fruit trees is for the subsequent year. [2] Hay only.

The 1900 census reported a total of 240,864 grapevines, but the number of vineyards decreased during the next 20 years, and by 1930 the production of grapes had become practically negligible, the number of vines reported in that year being only 5,016. This reduction was due at least in part to prohibition. The 1935 census reports an increase to 5,656 vines of bearing age and 3,095 vines not of bearing age.

Table 3, compiled from the United States census for 1930, gives the value of all agricultural products in 1929 by classes.

TABLE 3.—*Value of all agricultural products in Albemarle County, Va., 1929*

Fruits and nuts	$1,573,341	Other grains and seeds	$14,582
Cereals	610,741	Wool, mohair, and goat hair	10,182
Poultry and eggs produced	463,076	Nursery and greenhouse products	5,179
Hay and forage	437,685	Honey	4,079
Dairy products sold	334,683	Other field crops	568
Forest products, home use and sale	227,379		
Farm garden vegetables	205,402	Total	3,976,022
Vegetables, including potatoes and sweetpotatoes	89,125		

Orchard fruits, mainly apples and peaches, are the principal cash crops. The county agent states that on account of laws regulating grading and cleaning, the packing and handling of fruit has changed materially during the last few years. A large percentage of the fruit grown is now packed and marketed through grower owned and controlled cooperative packing houses, which pack and market the fruit under a uniform brand. The individual grower's responsibility ends when his tree-run fruit is delivered to the plant. Most organizations pool their fruit according to variety, size, and grade. Prior to 1934 foreign markets were good, but recently these markets have fallen off, owing to the production of apples in other countries, high duties on fruit, and shipping costs and restrictions; therefore, more apples are being sold on the home markets. Most of the red apples go to southern markets, green apples to northern markets, and peaches to northern markets.

Poultry products, which rank second to orchard fruits as a source of cash income, are marketed in Charlottesville, New York, and Philadelphia. The 241,788 chickens raised in 1929 were valued at $205,520, and the 778,632 dozens of eggs produced, at $241,376. Of these, 93,499 chickens were sold alive or dressed, and 477,147 dozens of eggs were sold. In 1934, 254,199 chickens were raised and 660,574 dozens of eggs produced. Every farm has a flock of chickens, ranging in size from a few hens up to a thousand or more. Many farmers use chickens and eggs as a medium of exchange.

There are 61 dairy farms in the county, with herds ranging from 10 to 90 head of cattle. Dairy products rank third as a source of cash income. The main breeds of dairy cattle are Holstein-Friesian, Guernsey, and Jersey. The production of milk was 2,891,297 gallons in 1929 and 2,978,787 gallons in 1934. Most of this production is marketed in the form of whole milk. Nearly all of the dairy products are sold through the two creameries in Charlottesville, although a small quantity of whole milk is shipped to Richmond.

Some beef cattle and a few hogs and sheep are sold for cash. The principal breeds of beef cattle are Hereford, Aberdeen Angus, and a few Shorthorn. Some of these cattle are sold as feeders, others directly for slaughter. Hogs and sheep are raised mainly for home consumption, but the surplus is sold mainly on the local market as a finished product. Poland China is the popular breed of hogs, but some Berkshires and Hampshires are raised. There were 18,057 cattle, 4,184 horses, and 7,838 swine on farms in 1935.

Some grain and hay is sold for cash, but corn is grown mostly for home use.

In 1929, 39.1 percent of the farms in the county reported the use of commercial fertilizer, at a total expenditure of $105,436, or an average of $106.61 a farm. Most of the fertilizer is bought ready mixed. For the last few years about one-fourth of the fertilizer bought was superphosphate. The county agent reports that the popular grades for corn are a 2–12–2 [3] or 4–16–4 mixture at the rate of from 100 to 300 pounds an acre. For grain, grass, and clover, from 200 to 400 pounds of superphosphate is used. The use of lime is also a general practice over most of the county. Most of the fertilizer for orchard use is home mixed, in which cyanamid, sulfate of ammonia, or nitrate of soda is used as a source of nitrogen. The general practice is to use 1 part of nitrate of soda to 2 parts of phosphate, applied to the orchards at the rate of 200 to 600 pounds an acre. Very few of the growers use potash at the present time. The general practice is to apply the fertilizer in the spring, but some growers use sulfate of ammonia in the fall and nitrate of soda and phosphate in the spring.

According to the 1930 census, $890,642 was expended for labor with 40.8 percent of the farms reporting this item, the average outlay being $863.02. Generally, labor is plentiful and consists of both white and colored. About 10 percent of the labor is hired by the day, and the rate of pay ranges from 75 cents to $1.

Of the 3,197 farms in the county in 1935, 1,368 were less than 30 acres in size, 1,317 ranged from 30 to 174 acres, 27 included 1,000 or more acres, and the rest ranged from 174 to 999 acres. The average size was 114.1 acres and has not changed appreciably in the last 25 years, although it is considerably smaller than that of 1880, which was reported as 202 acres.

The 1935 census reports 76.3 percent of the county, or 364,758 acres, in farms, of which 163,935 acres were available for crops, including cropland harvested, idle, and fallow, that on which crops were a failure, and plowable pasture.

Owners operated 80.4 percent of the farms in 1935, tenants 18 percent, and managers 1.6 percent. Tenancy, therefore, has actually decreased since 1880, when owners operated 75.4 percent of all farms and tenants 24.6 percent.

Only a few tenants pay cash rent, as most of the farms are rented on a share basis. Where the landlord furnishes seed, fertilizer, livestock, tools, house, and all other equipment, he gets two-thirds of the crops produced and the tenant one-third; but where the landlord furnishes only the land and house, the tenant gets three-fourths of the crops.

SOIL-SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field.

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures, such as those in road or railroad cuts, are studied. Each excavation exposes a series of distinct soil layers, or horizons, called, collectively, the soil profile. Each horizon of the soil, as well as the parent material beneath the

[3] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

soil, is studied in detail; and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The reaction of the soil [4] and its content of lime and salts are determined by simple tests. Drainage, both internal and external, and other external features, such as relief, or lay of the land, are taken into consideration, and the interrelation of soils and vegetation is studied.

The soils are classified according to their characteristics, both internal and external, with special emphasis on those features influencing the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics, soils are grouped into mapping units. The three principal ones are (1) series, (2) type, and (3) phase. Areas of land, such as coastal beach or bare rocky mountainsides that have no true soil, are called (4) miscellaneous land types.

The most important group is the series, which includes soils having the same genetic horizons, similar in their important characteristics and arrangement in the soil profile, and developed from a particular type of parent material. Thus, the series includes soils having essentially the same color, structure, and other important internal characteristics and the same natural drainage conditions and range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The soil series are given names of places or geographic features near which they were first found. Thus, Cecil, Appling, Davidson, Tatum, and Porters are names of important soil series in Albemarle County.

Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of the soil texture, such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, and clay, is added to the series name to give the complete name of the soil type. For example, Cecil loam and Cecil fine sandy loam are soil types within the Cecil series. Except for the texture of the surface soil, these soil types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping, and because of its specific character it is usually the soil unit to which agronomic data are definitely related.

A phase of a soil type is a variation within the type, which differs from the type in some minor soil characteristic that may have practical significance. Differences in relief, stoniness, and the degree of accelerated erosion are frequently shown as phases. For example, within the normal range of relief for a soil type, there may be areas that are adapted to the use of machinery and the growth of cultivated crops and others that are not. Even though there may be no important difference in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, there may be important differences in respect to the growth of cultivated crops. In such an instance the more sloping parts of the soil type may be segregated on the map as a sloping or hilly phase. Similarly, soils having differences in stoniness may be mapped as phases, even though these differences are not reflected in the character of the soil or in the growth of native plants.

[4] The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality, higher values indicate alkalinity, and lower values indicate acidity.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types, in relation to roads, houses, streams, lakes, section and township lines, and other local cultural and natural features of the landscape.

SOILS AND CROPS[5]

Albemarle County, by reason of a wide variety of good soils and favorable climate, has developed into one of the most important agricultural counties in the State. It is a leading fruit-growing county and has become internationally known through the production and sale of the famous apple, the Yellow Newtown (Albemarle Pippin).

The agriculture over the greater part of the county consists of the production of corn (which is grown on every arable soil in the county), hay, oats, and wheat, as subsistence crops, together with apples, peaches, poultry, dairy products, and a few hogs, beef cattle, and sheep as sources of cash income.

Albemarle County has a large variety of soils, due in part to the several important rock formations that underlie the county and have contributed material to the soils. These soils differ widely in their chemical and physical characteristics, owing to differences in the parent material from which they are developed, in relief, and in other environmental conditions. The dominant agricultural soils of the county are the loams and clay loams, which have subsoils ranging from brown to red in color.

The soils of the Cecil, Appling, and Porters series are developed from the weathered products of granitic materials and contain a relatively high percentage of potash, but are low in calcium-containing minerals.

All the soils in the county are deficient in organic matter. The Porters soils have a higher content than any of the others, because of their physiographic position and resultant climatic conditions.

The main agricultural soils lie in a large belt extending in a northeast-southwest direction across the geographical center of the county. Some of these soils, Davidson clay loam and Bucks silt loam, occupy large continuous areas, but the other soils occupy smaller irregular and disconnected areas. A fairly large unbroken area in the northwestern part of the county, the greater part of which is included in the Shenandoah National Park, is classified as rough stony land and is used principally for forestry. Near the southeastern and eastern borders is a large area of light-colored silt loam, on which little agriculture has been practiced, owing to its relatively low agricultural value.

A direct relationship exists in many places between the soils and the crops to which they are adapted, and for many of the soils a definite land use, based on the soil and other conditions, has been worked out.

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[5] The soil boundaries that cross Albemarle County into Orange County do not everywhere agree with the soil map of the latter county previously published. These differences are due to a better understanding of the soils since Orange County was surveyed and to abrupt changes in underlying geological formations in some places near the county line. Cecil loam in Albemarle County joins Tatum loam in Orange County; Cecil loam, hilly phase, joins Tatum clay loam in one area and Wadesboro loam, eroded phase, in another; and Bucks silt loam joins Penn silt loam.

Considering the agricultural use and capabilities of the soils, they may be grouped, as follows: (1) Soils with brown to red surface soils, (2) soils with light-gray surface soils, and (3) miscellaneous soils and land types.

In the following pages the soils are described in detail and their agricultural importance is discussed; their distribution in the county is shown on the accompanying soil map; and their acreage and proportionate extent are given in table 4.

TABLE 4.—*Acreage and proportionate extent of the soils mapped in Albemarle County, Va.*

Soil type	Acres	Per-cent	Soil type	Acres	Per-cent
Davidson clay loam	24,256	5.2	York silt loam	5,568	1.2
Davidson clay loam, hilly phase	22,272	4.7	York gravelly silt loam	9,920	2.1
Cecil loam	38,464	8.2	Altavista silt loam	512	.1
Cecil loam, hilly phase	86,080	18.3	Orange silt loam	1,216	.3
Cecil fine sandy loam	3,520	.8	Alluvial soils (Congaree soil material)	2,688	.6
Appling loam	6,272	1.3	Stony colluvium (Porters soil material)	1,024	.2
Appling loam, hilly phase	10,496	2.2	Davidson clay loam, steep phase	22,720	4.8
Appling fine sandy loam, hilly phase	5,376	1.1	Cecil loam, steep phase	27,904	5.9
Porters loam	14,400	3.1	Appling loam, steep phase	13,312	2.8
Bucks silt loam	8,704	1.9	Penn silt loam, steep phase	3,712	.8
Penn silt loam	6,336	1.3	Nason silt loam, steep phase	21,312	4.5
Penn fine sandy loam	704	.2	Porters stony loam	25,600	5.4
Wickham fine sandy loam	448	.1	Lehigh silt loam	448	.1
Wickham fine sandy loam, high-terrace phase	512	.1	Rough stony land (Porters soil material)	42,048	8.9
Congaree silt loam	9,600	2.0	Rock outcrop	256	.1
Congaree loam	14,336	3.1			
Tatum silt loam	13,312	2.8	Total	470,400	
Nason silt loam	19,648	4.2			
Nason silt loam, gravelly phase	7,424	1.6			

SOILS WITH BROWN TO RED SURFACE SOILS

The group of soils with brown to red surface soils includes Davidson clay loam; Davidson clay loam, hilly phase; Cecil loam; Cecil loam, hilly phase; Cecil fine sandy loam; Appling loam; Appling loam, hilly phase; Appling fine sandy loam, hilly phase; Porters loam; Bucks silt loam; Penn silt loam; Penn fine sandy loam; Wickham fine sandy loam; Wickham fine sandy loam, high-terrace phase; Congaree silt loam, and Congaree loam.

These soils constitute 53.6 percent of the area of the county and dominate the agriculture. They occur in broad continuous areas through all parts of the county, except along the southeastern and eastern borders, the northwestern part, and some of the rougher parts of the Ragged Mountains and in the southwestern part. The relief of the soils of this group differs greatly, as the upland types range from almost level to gently rolling, rolling, and hilly, the rolling and hilly relief occurring in areas of the hilly phases of Davidson clay loam, Cecil loam, Appling loam, and Appling fine sandy loam. The soils developed in the first bottoms and on the second bottoms are almost level to flat.

All the soils of this group are naturally well drained internally and externally, with the exception of Congaree silt loam and Congaree loam; and even these soils ordinarily are well drained, but they are subject to overflow.

The rolling to steeply sloping relief of the hilly phases of Davidson clay loam, Cecil loam, Appling loam, and Appling fine sandy loam would eliminate them from this group on the basis of their agricultural use and adaptability, but they are inherently better soils than those in the group of soils with light-gray surface soils. The soils of these hilly phases require different methods of management, are more subject to sheet and gully erosion, and are more expensive to farm than the typical smoother soils of this group.

The soils of this group produce the greater part of all the agricultural products of the county. Although corn is grown on every arable soil, the yields and cost of production differ with the individual soil. Congaree silt loam is the premier soil for the production of corn, and larger yields are obtained on this soil without fertilization than are usually obtained on the upland soils with ordinary applications of commercial fertilizers.

Davidson clay loam is recognized as the best soil in the county for the production of alfalfa and grasses. Porters loam is the ideal soil for growing good-quality apples, especially the green varieties, largely because of the climatic conditions, which retard the blossoming of the trees until danger of frost is past.

Most of the peaches in the county are grown on Appling loam and Cecil loam, though some are grown on Davidson clay loam. Peach trees do not require much organic matter in a soil, and Appling loam, which contains less organic matter than other members of this group, as its lighter color indicates, is much desired for the production of peaches.

The Bucks, Davidson, and Cecil soils are the best soils in the county for growing grasses, wheat, and other small grains. Most of the dairy farms are situated on these soils. A large variety of garden vegetables are grown on these soils for home use and to supply the local markets, principally Charlottesville.

Davidson clay loam.—This soil, locally known as "red land" or "push land," in forested areas has a thin layer of leafmold on the surface. The topmost 2 or 3 inches of the surface layer is darkened by an admixture of organic matter from this decomposed leaf litter and is a dark-brown to reddish-brown heavy silt loam, passing rather abruptly into a heavy clay loam, which extends to a depth of 7 or 8 inches. In cultivated fields the upper layers are thoroughly mixed to form a reddish-brown to red heavy clay loam. This is underlain by a deep-red or maroon clay subsoil ranging from 30 to 40 inches in thickness. The subsoil is a heavy smooth clay that breaks into small irregular lumps when air-dried but is somewhat plastic when wet. In places it contains numerous soft black concretions of manganese oxide. The subsoil gradually becomes lighter in texture and color as it passes into the mottled reddish-brown, ocher-yellow, and white friable soil material from which it is developed. Beneath this parent material, at a depth ranging from 5 to 10 feet, the dark-colored basic rock is reached. In places some dark-colored heavy rock occurs in the subsoil and near the surface. In most places Davidson clay loam is uniform, although some variations occur in the content of rock, depth of weathering, and texture of the surface soil. As mapped, this soil includes a few small areas of Davidson loam and Montalto loam that were too small to separate on the scale

used. Montalto loam is distinguished from the typical soil by a somewhat lighter texture and color of the surface soil and subsoil.

The total area of Davidson clay loam in the county is 37.9 square miles. The largest bodies occur on each side of Carter Mountain and the Southwestern Mountains, a ridge that traverses the county in a northeast-southwest direction beginning at Carters Bridge on the Hardware River, where the underlying rock is greenstone or altered diorite or other basic rock. Other smaller areas, scattered throughout the piedmont belt of the county, have developed from the weathered material of numerous dikes of diorite, amphibole, and diabase.

The land is undulating to rolling and is cut by numerous small streams. Drainage is good, and the subsoil is very retentive of soil moisture. This soil has suffered considerable sheet erosion, but in places the soil mantle is so thick that it will stand considerable surface wash without serious injury.

Practically all of this soil has been cleared of its original forest cover of various oaks, poplar, locust, maple, hickory, some cedar and pine, and most of it (about 90 percent) is at present being used for agricultural purposes.

Davidson clay loam is generally recognized as being inherently one of the most productive soils in the Piedmont Plateau. It is well suited to the production of corn, small grains, alfalfa, and clover, and in this section particularly it produces an excellent bluegrass sod and is in great demand for the production of grapes. Its productivity can be built up and maintained by adding lime and barnyard manure, by turning under green-manure crops, and by using small quantities of commercial fertilizers high in phosphoric acid.

Corn is the main crop, and acre yields range from 30 to 50 bushels. Other crops grown are wheat, hay, and oats, and in a smaller way orchard fruits, grapes, bluegrass for pasture, rye, potatoes, sweetpotatoes, and garden products.

Small grains, grass, and clover are usually fertilized with a mixture high in phosphoric acid, such as 2–12–2, at the rate of 200 to 400 pounds an acre. When properly treated, wheat yields 15 to 25 bushels, oats 20 to 40 bushels, hay 1½ to 2 tons, and alfalfa 2 to 3 tons an acre. This land requires rather heavy machinery and heavy work animals for handling, and it must be cultivated under proper moisture conditions, owing to its heavy surface texture.

This soil, as well as its hilly phase, is much desired for apple growing and for grape culture, especially since grape growing has been recently rejuvenated. Some of the oldest and best vineyards were on this soil, and the wines produced were particularly good for blending with other wines.

Davidson clay loam, hilly phase.—The hilly phase differs from typical Davidson clay loam mainly in its rougher relief, which is steeply rolling to hilly. The soil profile is identical with that of the typical soil, with the exception that generally the subsoil of the hilly phase is not quite so thick as that of the typical soil. Both sheet erosion and gullying are much more pronounced than on the typical soil, and in cultivated fields numerous red clay spots are noticeable where the brownish-red clay loam surface soil has been removed by surface wash. Yields on soil of this phase are not quite

so good as those on typical Davidson clay loam, and cost of production is greater, as more care must be taken to prevent erosion and improved farm machinery cannot be used so advantageously. The general practice is to cultivate the tops of the hills and leave the slopes in grass and trees. The same crops are grown on soil of this phase as on the typical soil, but a larger proportion of the hilly phase is in grass than of the typical soil.

The largest areas of this soil are in the southwestern part of the county, extending from the Nelson County line in a northeasterly direction beyond the Hardware River, and in the northeastern part on either side of the Southwestern Mountains. Smaller areas are in the vicinities of Covesville and Ivy Depot. A total of 34.8 square miles of Davidson clay loam, hilly phase, is mapped in this county, and about 60 percent of this area is cleared and is in crops or in fallow land and pasture.

Cecil loam.—In cultivated fields the topmost 6- or 7-inch layer of Cecil loam is grayish-brown to light reddish-brown mellow loam. Gall spots in places indicate the removal of a considerable part of the surface material by erosion and the partial or complete exposure of the red clay subsoil. In wooded areas the topmost 3- or 4-inch layer is somewhat darkened by the presence of organic matter composed of decayed leaf litter and other forest debris. Beneath the surface layer is a transitional layer, ranging from 3 to 5 inches in thickness, consisting of yellowish-red friable light clay loam that becomes somewhat heavier textured in the lower part where it rests on the heavy-textured but brittle red clay subsoil. The subsoil extends to a depth ranging from 34 to 40 inches and grades into a dull-red clay that is more friable than the layer above and contains, in places, splotches of brownish yellow, grayish brown, and white. The thickness of this layer varies, in some places being only 10 inches and in others as much as 30 or more inches. Below this is the partly disintegrated granitic material from which the soil is formed.

Included with Cecil loam as mapped are a few small areas of Cecil very fine sandy loam and Cecil clay loam. The very fine sandy loam areas have a grayish-brown very fine sandy loam surface soil, whereas the clay loam areas have a reddish-brown or red clay loam surface soil. Here and there in small areas quartz gravel is present on the surface and mixed with the surface soil. Such areas are shown on the soil map by gravel symbols.

Cecil loam is one of the extensive and agriculturally important soils in the county, occurring in fairly large and small irregular bodies throughout the south-central, central, and north-central parts. The total area mapped is 60.1 square miles, of which about 75 percent is cleared and used for agricultural purposes.

The land is undulating and gently rolling to rolling, and both external and internal drainage are good. This soil is subject to considerable sheet erosion, especially in places where ordinary care in farm operations is not practiced, as evidenced by the red galled spots.

Cecil loam is recognized as one of the county's best general-purpose soils. In many places in the county it is badly run down, owing to poor farming methods, but it is capable of being built up and maintained in a good state of fertility. The principal crops grown are

corn, hay, wheat, oats, soybeans, cowpeas, potatoes, and orchard fruits, and the yields of all crops are better than the average for the county. About three-fourths of the cultivated land is used for corn, hay, and small grains. Corn is fertilized with 100 to 200 pounds of 2–12–2 or 4–16–4 and yields 20 to 45 bushels an acre, depending largely on the condition of the land and the treatment it receives. From 200 to 400 pounds an acre of a fertilizer high in phosphate, or fairly heavy applications of phosphate alone, are used for growing grasses and small grains, and the yields are only slightly less than those obtained on Davidson clay loam. Wheat yields range from 15 to 25 bushels, oats 20 to 40 bushels, and hay 1 to 2 tons an acre. Good and profitable crops may be obtained on this soil if the land is properly prepared.

Cecil loam, hilly phase.—The hilly phase differs from typical Cecil loam mainly in that it has a more rolling relief, and therefore, in cultivated areas, sheet erosion or surface wash is much more apparent and the surface layer is thinner than in the typical soil, so that in many places the surface texture is a clay loam. Several areas of Cecil clay loam, hilly phase, are included with this phase in mapping.

As the relief is steeply rolling to hilly, improved farm machinery cannot be used so advantageously as on typical Cecil loam, and care must be taken to prevent serious washing of the soil on the slopes.

Cecil loam, hilly phase, is more extensive than the typical soil, a total of 134.5 square miles being mapped. It occupies rather large irregular bodies in the central, south-central, and north-central parts of the county, closely associated with Cecil loam. Small areas southwest of Unionville, north of Oak Hill School, and north of Ivy Depot, in which stones and angular gravel are strewn over the surface, are indicated on the soil map by symbols. Some other areas have a few stones and gravel scattered over the surface but not in sufficient quantity to interfere with the cultivation of the soil.

Cultivated fields and fallow land make up about 50 percent of this land, and the rest has a forest cover, largely made up of white oak, post oak, hickory, poplar, maple, dogwood, and cedar. The same crops are grown as on typical Cecil loam, but the yields are not so good. The cultivated crops are planted on the tops of the rounded hills and gentler slopes, and the steeper slopes are kept in grass. Some dairying is carried on.

Cecil fine sandy loam.—This soil is closely associated with the more extensive Cecil loam, and the two soils grade into each other. In cultivated fields the surface soil ranges from grayish yellow to grayish brown, the soil in most areas having a light-brown cast to a depth of 5 to 8 inches. The subsurface layer is yellowish-red clay loam or heavy fine sandy clay. The subsoil is red clay, fairly stiff but moderately brittle, being more crumbly and friable than the subsoil of Cecil loam. This grades at a depth ranging from 30 to 40 inches into a lighter red friable material, which gradually passes into the light-colored arkosic sandstone from which the soil is developed. As mapped, this soil includes small areas of Cecil loam and Appling loam. In a few areas some angular stones are on the surface and mixed with the soil. These areas are shown on the soil map by symbols.

The largest areas of Cecil fine sandy loam are developed south of Batesville, west and southwest of Charlottesville, and southeast of

North Garden. This soil occupies undulating to gently rolling areas, and both surface and internal drainage are good.

Most of this soil has been farmed. The original growth was dominantly hardwoods, but old-field pine and scrub pine (*Pinus virginiana*) indicate areas formerly cultivated. The main crops grown on this soil are corn, wheat, oats, soybeans, cowpeas, apples, and garden vegetables. The yields are slightly less than those obtained on Cecil loam under similar fertilization and cultural treatment. The soil is easy to handle, responds readily to fertilization, and is well suited to the production of garden vegetables and truck crops.

Appling loam.—The 6- to 8-inch surface layer of Appling loam in cultivated fields is a grayish-brown loam that is light gray when dry. Beneath this is a subsurface layer, 2 or 3 inches in thickness, consisting of pale-yellow or grayish-yellow heavy loam or clay loam, overlying the typical subsoil, which is a reddish-yellow rather heavy but brittle clay. Normally this layer is not so heavy-textured as the subsoil of typical Cecil loam. It extends to a depth ranging from 26 to 40 inches, where it passes into yellowish-red slightly compact but friable clay marbled or splotched with light red, brownish yellow, and gray. This lower layer ranges in thickness from 10 to 20 inches and passes into the partly decomposed granitic parent material.

In a few small areas southwest of Montvale School and west of Free Union, the subsoil has a yellow color and is slightly lighter in consistence than typical. Such areas would be separated as a type of the Durham series if they were large enough. In many places small outcrops of granite occur. In a few local areas a little quartz gravel and angular stone occur, but not in sufficient quantities to hinder cultivation.

The gently rolling to rolling relief of this soil gives it good surface drainage. The surface soil absorbs rain water, and the subsoil has a good water-holding capacity. Nevertheless, the soil is subject to considerable surface wash, as evidenced by the reddish-yellow clay loam spots that appear in any freshly plowed field, and gullying is apparent along many of the steeper slopes, especially in peach orchards, where cultivation is necessarily clean, if proper care is not taken to check the rapid run-off of water. In some places the more sloping areas have been terraced, but this is not the general practice.

Appling loam is not extensive, occurring in irregular-shaped areas ranging from a few acres to 3 square miles. The larger areas are in the vicinity of Free Union, west of Montvale School, and near Crozet, and smaller areas are in the vicinity of Proffit and 2 miles east of Advance Mills. Most of this soil has been cleared for cultivation, and at present 80 percent of it is used for agricultural purposes. Because it can be built up and maintained in a good state of fertility, Appling loam is considered a very good general-purpose soil, but not so good as Davidson clay loam and Cecil loam for the general farm crops grown in this county. The principal crops are corn, hay, wheat, oats, and orchard fruits. Some sweetpotatoes, potatoes, and garden vegetables are grown for home use. Crop yields are not so good as on Cecil loam under similar treatment. Better yields of corn are obtained when corn follows a crop of legumes. Corn yields from 25 to 35 bushels, wheat 10 to 25 bushels, and hay 1 ton an acre.

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Some farmers fertilize the land with 100 to 300 pounds of superphosphate, but, in general, fertilizer treatments for small grains and grass are the same as are practiced on Cecil loam.

Areas of this soil in the vicinity of the Crozet peach section are used for the production of peaches, and peach trees observed on it were in a good, healthy condition. The yields and quality are good.

Appling loam, hilly phase.—The hilly phase differs from typical Appling loam mainly in its more rolling to hilly relief. In fields that have been cleared and cultivated for a number of years the surface layer is on the whole shallower than that of the typical soil, and most areas have somewhat more loose rock and gravel over the surface, in places sufficient to interfere with cultivation. The underlying parent material is of the same granitic origin as that of Appling loam.

As the name, hilly phase, implies, the relief is steeply rolling to hilly, and both external and internal drainage are good. Owing to its hilly relief, the danger of serious surface wash and gully erosion is much greater than on typical Appling loam; and where farmed, unless the proper measures are taken to protect it from erosion, such as contour tillage, strip cropping, and building terraces on the steeper slopes, it soon loses its value as an agricultural soil. Many hillsides, formerly cultivated, are now abandoned because of soil losses due to improper farming methods.

This phase is more extensive than the typical soil. The larger areas occur near Free Union and south of Nortonsville, and smaller areas are in the vicinity of Burnleys along the Southern Railway, south of Yancey Mills, and south of Whitehall.

Only about 20 percent of this soil is cultivated; the rest is in forest consisting of white, red, and post oaks, hickory, pine, cedar, and dogwood. The cultivated areas are used for the same crops as are grown on typical Appling loam, and the treatment is practically the same, but the yields are smaller.

Appling fine sandy loam, hilly phase.—This soil is closely associated with Appling loam and Appling loam, hilly phase. Soil of this phase differs essentially from Appling loam, hilly phase, in being lighter colored in the surface soil and containing more sand in the subsoil, which gives it a granular structure and a more friable consistence than the subsoil of Appling loam. It also differs from Appling loam, hilly phase, in that it is underlain by and developed from arkosic sandstone, which resembles the granitic material underlying Appling loam. In a few places the surface soil contains some coarse quartz sand, and the lower subsoil material carries a noticeable amount of small particles of blue quartz. Soil of this phase as mapped includes small areas of Appling loam, hilly phase, and in many places grades imperceptibly into that soil.

Appling fine sandy loam, hilly phase, occupies several fair-sized areas, the largest of which are 1 mile north of Crozet, north, west, and south of Whitehall, and east of Sugar Hollow.

This soil is developed on rolling to hilly relief and is everywhere naturally well drained. Under clean cultivation it is subject to accelerated erosion, and in some places all the surface soil has been removed and shallow gullies have formed.

Only a small proportion of Appling fine sandy loam, hilly phase, is under cultivation, and the rest is forested to white, red, and post oaks, hickory, pine, cedar, and dogwood. Areas formerly cultivated and abandoned have grown up to old-field pine and scrub pine. The cultivated areas are used for the same crops as are grown on Appling loam, hilly phase, and the treatment is practically the same as that for Appling loam. Considerable care should be exercised in the handling of this soil, because of its steeply sloping surface, and because of the danger of serious erosion and gullying. Terracing and strip farming are recommended as methods of protection to this soil. A considerable part of the cultivated land should be reforested.

Porters loam.—This soil, known as the brown soil developed on the Blue Ridge, has a brown mellow loam surface soil, ranging from 6 to 10 inches thick, which gradually becomes heavier in texture as it grades into the subsoil through a brown to yellowish-brown or reddish-brown transitional layer ranging from 8 to 12 inches thick. The surface soil contains some organic matter, and in virgin areas a thin layer of leafmold is present on the surface. No definite line of demarcation occurs between the subsurface layer and the subsoil, as occurs in soils of the piedmont belt such as the Cecil and Appling. The subsoil conists of reddish-brown friable clay or clay loam, which extends to various depths but in few places is more than 40 inches deep. This is underlain by partly decomposed granitic material from which the soil is developed.

The color, texture, and consistence vary greatly throughout all areas of this soil. On some of the steeper slopes the soil material is very shallow, consisting of only a few inches of soil over the underlying rock. Varying quantities of rock fragments are scattered over the surface in most places. In some of the coves and at the bases of slopes the surface soil is deeper and of a darker brown color. Such areas have a much higher organic-matter content and are greatly desired for growing apples. Included with Porters loam as mapped west and south of Sugar Hollow are small areas of soil with a reddish-brown surface soil and a maroon-red stiff but brittle clay subsoil. Such areas are typical Rabun soil, but owing to their small extent they are included with the Porters soil.

Porters loam has a steep relief and thorough drainage, but, owing to the open structure of the surface soil and the subsoil, normal rainfall is readily absorbed and erosion is not nearly so pronounced as it is on the soils of the piedmont belt with smoother relief.

It occupies comparatively small areas in the northwestern mountain land and in the range of mountains of which the Fan Mountains form a part and which includes a considerable area in the south-central and southwestern parts of the county.

Owing mainly to the rather steep relief, Porters loam is not considered a good general-purpose soil, although a large proportion of it has been cleared and used for agricultural purposes. Corn yields range from 20 to 35 bushels an acre, wheat from 10 to 20 bushels, and potatoes from 100 to 200 bushels. Fertilizer treatments are about the same as those practiced on the lower lying soils of the piedmont belt.

Porters loam is considered an excellent soil for growing apples, and the greater part of the cleared area is at present in orchards. Much of

this soil lies in the so-called thermal belt, an area where the climatic conditions are such as to retard the blooming of the trees until danger of frost is past. This soil, owing to its relatively high organic content, the open and friable nature of its surface soil and subsoil, and the air-drainage conditions of the area, is well adapted to growing apples. On the whole, trees on this soil, especially in the coves, do not suffer from lack of moisture as they do on some of the lower lying land. This soil is particularly adapted to the growing of the greener varieties, such as Yellow Newtown, York Imperial, Grimes Golden, and Delicious. The Yellow Newtown, which has a world-wide reputation for color and flavor, is produced mainly on this land.

Bucks silt loam.—This soil is closely associated in occurrence and in derivation with the Penn soils but differs from them in having a much thicker or deeper subsoil over the bedrock. In color it closely resembles Penn silt loam. In cultivated fields, the topmost 6- to 8-inch layer of Bucks silt loam is reddish-brown or purplish-red smooth mellow silt loam, which grades into a 2- to 4-inch layer of purplish-red silty clay loam. The subsoil, extending to a depth of about 24 inches, is Indian-red or purplish-red silty clay that is moderately stiff but brittle and in the lower part contains a few black specks and a few small mottles of rust brown. This grades into Indian-red silty clay, which extends to a depth ranging from 36 to 40 inches or more and in the lower part becomes somewhat lighter in texture and consistence than the material in the layer above. This is underlain by soft purplish-red partly decomposed shale fragments and silty clay, which grade at various depths into the partly weathered Indian-red shale. The characteristic Indian-red or purplish-red color of the Bucks and Penn soils distinguishes them from the other red soils of the Piedmont Plateau.

Included with Bucks silt loam as mapped are a few small flat areas at the heads of small drainageways in which the surface soil is a brown loam and the subsoil a yellow or reddish-yellow clay that becomes mottled in the lower part. Were such areas more extensive, they would be mapped as a Lansdale soil. Small areas of Penn silt loam and Penn clay loam are also included with Bucks silt loam in mapping.

The land is undulating to gently rolling and consists of a series of low ridges with long gentle slopes extending toward the southeast. Both external and internal drainage are good, except in the small included areas of Lansdale soil.

Bucks silt loam is developed in a more or less broad area in the southeastern part of the county northeast and southeast of Glendower. It includes an area of 13.6 square miles, and practically all of it is cleared and in pasture or fallow land or is used for crops. Owing to its comparatively smooth surface, it is easily cultivated with heavy farm machinery. Most of this land seems to be in a good state of productivity, and many good farms are located on it. The main crops grown are corn, hay, and small grains. The rotation usually practiced is corn, wheat, and clover, and the fertilizer treatment is about the same as that on Cecil loam. Although inherently it is not so strong a soil as Cecil loam and Davidson clay loam, its relief and physical characteristics are such as to make it capable of being built up and maintained in a good state of productivity, so that it has about the same agricultural value as the Cecil and Davidson soils, which are considered the best soils of the piedmont area. Corn yields range from

25 to 40 bushels, wheat 10 to 15 bushels, and hay 1 to 2 tons an acre. Red clover does well on this soil if the land is limed.

Penn silt loam.—This soil differs mainly from Bucks silt loam in having a thinner subsoil layer over the shale, but the color, texture, and consistence of the two soils are similar. The surface soil of Penn silt loam, to a depth ranging from 5 to 8 inches, is Indian-red or purplish-red mellow friable silt loam. The subsoil to a depth ranging from 12 to 24 inches is Indian-red or purplish-red brittle and friable silty clay loam or silty clay and grades into the soft partly decomposed Indian-red shale. Here and there, erosion has removed part or all of the surface soil and even part of the subsoil, leaving only a shallow layer of soil material over the soft shale, and in some places this soft shale is reached in plowing. Included with this soil in mapping are small areas of Bucks silt loam.

The relief is rolling to moderately hilly, and surface drainage is good. Some of this soil has been abandoned, owing to accelerated erosion, and allowed to grow up in old-field pine and cedar. Most of Penn silt loam is developed along the breaks of the drainageways and adjoins the smoother areas of Bucks silt loam.

Penn silt loam occupies several fairly large areas in the southern part of the county near the James River, the largest being in the vicinity of Boiling Spring, west and northwest of Scottsville, and north and south of Glendower.

At present only a small proportion of Penn silt loam is under cultivation, and the rest is forested to post oak, chestnut oak, white oak, red oak, some hickory, walnut, pine, cedar, and locust. On areas formerly cultivated, old-field pine and scrub pine predominate. Penn silt loam is used for growing corn, wheat, oats, and pasture grasses. The fertilizer treatment and cultural methods are about the same as those for Bucks silt loam, but the yields are lower, and the soil generally is not in such a high state of productivity. In the spring, when moisture conditions are favorable, grass makes a good start; but owing to the shallowness of the surface soil and subsoil, moisture conditions are not favorable during the dry season of the year, and the grass dries quicker than on the Bucks soil. Penn silt loam should be handled with care to prevent erosion, as the loss of a few inches of soil is serious where the bedrock lies so near the surface.

Penn fine sandy loam.—This soil has a 6- to 10-inch surface layer of grayish-brown to grayish-purple fine sandy loam, overlying a purplish-red or Indian-red friable silty clay loam subsoil. The subsoil continues to a depth ranging from 20 to 26 inches, where it rests on partly weathered red shale and brown fine-grained sandstone. In places the surface soil contains a rather large amount of coarse sand and small round quartz gravel. This soil occupies ridges in areas of Penn silt loam and has a rolling to steeply rolling relief. Included with Penn fine sandy loam as mapped is a small area of Granville fine sandy loam 1½ miles southeast of Porters. This soil has a surface layer of gray fine sandy loam and a yellow friable clay loam subsoil.

Only 1.1 square miles of Penn fine sandy loam is mapped in this county, the largest area being about 2 miles northeast of Warren, and other small areas north of Scottsville and one-half mile north of Mount Zion Church. This soil is mainly in fallow fields and forest, the tree growth being mostly pine, cedar, and oak.

Wickham fine sandy loam.—The 6- to 7-inch surface layer of Wickham fine sandy loam is grayish-brown to brown mellow fine sandy loam. The layer beneath, or the subsoil, is brownish-red to reddish-brown friable clay loam or crumbly fine sandy clay, which extends to a depth ranging from 28 to 34 inches, where it passes into a reddish-brown or brownish-red friable soil material that is splotched and streaked with yellowish brown or grayish yellow. This lower material is much lighter in texture than the subsoil and in many places contains a large quantity of small rounded gravel. Some water-worn gravel also occurs in places on the surface and is present throughout the soil mass.

This soil is developed on smooth to gently rolling second bottoms, and both surface and internal drainage are everywhere well established. A few small disconnected areas lie on the second bottoms, or terraces, along the lower reaches of the Rivanna River and its main tributary in that section, Buck Island Creek. One small area is mapped along the Hardware River 1¼ miles northeast of Mount Pleasant School. Its total area is less than 1 square mile. This is a good soil, and all of it is cultivated. Corn, the chief crop, yields from 25 to 40 bushels an acre. Oats and wheat do well.

Wickham fine sandy loam, high-terrace phase.—This phase is developed only in three places. Two areas are in the vicinity of Hatton School in the extreme southeastern corner of the county, another is on the north bluff of the Hardware River 4 miles north of Scottsville, and still another is along the Rivanna River near the point where it leaves the county. The soil is derived from old alluvial material. This soil has developed a profile similar to that of Cecil loam, showing that it is a very old soil, but the surface and subsurface layers are thicker than the corresponding layers of Cecil loam, and the subsoil is more friable.

The 10- to 12-inch surface layer consists of grayish-brown fine sandy loam, passing into a subsurface layer of yellowish-red friable fine sandy loam from 3 to 5 inches thick. This is underlain by the red or brownish-red crumbly fine sandy clay subsoil. At a depth of about 40 inches the material becomes lighter in texture and slightly mottled. Some rounded quartz gravel occurs on the surface and scattered through the soil mass.

This soil is used mainly for pasture and growing corn. Yields are about the same as on the Cecil soil but much better than on the surrounding Nason soils.

Congaree silt loam.—To a depth of about 12 to 16 inches, Congaree silt loam is brown, dark-brown, and in some places reddish-brown mellow silt loam. This is underlain by light-brown heavy silt loam or silty clay loam, which extends to a depth ranging from 30 to 40 inches. Beneath this layer the soil material is generally mottled with grayish brown, grayish yellow, yellow, and drab. In places this mottled layer is reached at a depth of 26 inches. Along the streams that flow through and out of Davidson clay loam areas, the 6- to 14-inch surface layer is a brownish-red silt loam. A few small areas of Bermudian silt loam along Miller, Totier, and Rock Castle Creeks in the southeastern part of the county are included with Congaree silt loam in mapping. These areas have a dull reddish-brown or purplish-red silt loam surface soil and a reddish-brown silty clay subsoil.

Congaree silt loam comprises a total area of 15 square miles. It is widely distributed in most of the stream bottoms, although more of it is along the streams in the eastern part of the county. Most of the areas are narrow, in few places more than one-fourth of a mile in width. The land is almost level but has a slight grade toward the stream and in the direction of its flow. For a bottom soil it is well drained, but all of it is subject to overflow.

The native vegetation consists of sycamore, ash, elm, water oak, willow, and birch, but most of the land is cleared and in pasture or cultivated crops.

Congaree silt loam is recognized as naturally the most fertile soil in the county. Most of it is used for corn, a crop to which it is especially well adapted, yields ranging from 25 to 50 bushels an acre without fertilizer. Native-grass hay yields from 1 to 2 tons an acre. Crops are grown on this soil without the use of fertilizer.

Congaree loam.—This soil, to a depth of 14 or 16 inches, is a grayish-brown or brown loam, overlying a slightly lighter brown friable heavy loam or clay loam. The subsoil extends to a depth ranging from 30 to 40 inches, where it becomes lighter in texture and color and is generally mottled with rust brown and grayish yellow.

Areas of Congaree fine sandy loam are included with Congaree loam in mapping. In places, especially in the bottoms of some of the larger streams, small areas of brown deep fine sand occupy low narrow ridges or isolated knolls, and in many places a very narrow strip of this fine sand along the edge of the stream channel forms a natural levee.

Congaree loam covers a total area of 22.4 square miles and is widely distributed along streams throughout the county, especially in the piedmont section. Most of the areas are more or less narrow, gently undulating, and slope slightly toward the stream and in the direction of its flow. The largest areas border the Rivanna River, and the widest is formed at the junction of the North and South Forks 1½ miles northeast of Rio.

Drainage conditions are good for a bottom soil, but the land is subject to overflow during periods of heavy rainfall.

Practically all of the land is cleared, and most of it is used for growing corn, which yields from 25 to 50 bushels an acre without the use of fertilizer. Some land is in pasture, and some is used for the production of hay, which yields from 1 to 2 tons an acre. The areas that have a deep fine sand or sandy loam surface soil are used for growing watermelons, muskmelons, and sweetpotatoes.

SOILS WITH LIGHT-GRAY SURFACE SOILS

The group of soils with light-gray surface soils comprises what is locally called the "gray lands." It includes Tatum silt loam; Nason silt loam; Nason silt loam, gravelly phase; York silt loam; York gravelly silt loam; Altavista silt loam; and Orange silt loam.

These soils, with the exception of Orange silt loam, occur in a belt along the eastern boundary of the county, which begins as a very narrow strip in the northeastern part, extends south along the Fluvanna and Louisa County lines, attains its greatest width at Blenheim and Woodridge, and then divides, one part extending down to Scotts-

ville and the other part extending west of the section of Bucks and Penn soils to the Rockfish River west of Howardsville. Small areas of Orange silt loam are scattered along a line parallel to this belt several miles to the west.

The land is gently rolling to rolling and is thoroughly dissected by natural drainageways and intermittent drains. Surface drainage is good and internal drainage fair, except in the Orange and Altavista soils. Because of their silty texture, those soils tend to run together when wet and to bake on drying.

The surface soils of members of this group are very light gray to pale grayish yellow, and the subsoils are yellow, reddish-yellow, or red moderately friable silty clay, except that of Orange silt loam, which is heavy and plastic. Most of the soil materials have been derived from the weathering of very fine grained schists.

These soils are decidedly deficient in organic matter, as the prevailingly light gray color of the surface soil indicates. They are moderately to strongly acid, inherently low in plant nutrients, and are rightly considered the poorest soils in Albemarle County. Tatum silt loam is the best soil of the group and is capable of being built up to a fair state of fertility, but, because of its association with the other poor soils, it also is considered poor.

This is the least-developed farming section of similar relief in the county, and only a very small proportion of the land has been cleared for cultivation. Practically all of the merchantable timber has been cut, and the land now supports a growth of scrub oak and pine.

Corn, oats, wheat, and garden vegetables are the principal crops grown on the comparatively small cultivated areas. Yields are lower than the average for the county.

Tatum silt loam.—This soil, locally known as "gray land," has a 3-inch surface layer of light grayish-yellow floury silt loam, grading into a subsurface layer of pale-yellow to reddish-yellow silt loam somewhat heavier than the surface material. Beginning at a depth of 8 or 9 inches, the typical subsoil consists of bright-red silty clay, from 16 to 24 inches thick. The material is stiff but brittle and breaks into irregular-shaped lumps and finally into a granular mass. When wet it is slightly sticky but in an air-dry condition is hard and brittle. It has a smooth feel when rubbed between the fingers. The lower part of the subsoil is lighter in texture than the upper part and slightly mottled with yellow and brownish yellow. In places soft partly decomposed platy particles of schist are present in the lower part of this layer. At a depth of about 40 inches the underlying schist in various stages of decomposition is reached.

Tatum silt loam is not nearly so good a soil as the Davidson, Cecil, and Appling soils, but, compared with the other members of this group, it is a relatively good soil, and more of it is used for agricultural purposes.

Included with this soil as mapped are small areas of Nason and York soils and of Tatum clay loam. Some angular fragments of quartz rock and fine angular quartz gravel are scattered over the surface of most areas, and where this material is very abundant, as in the vicinity of Spring Hill Church, the areas are shown on the map with rock or gravel symbols.

Areas of this soil are gently rolling to rolling, both external and internal drainage are good, and the soil is more droughty than soils

of the Cecil and Appling series. It is very susceptible to erosion, as evidenced by the gall spots in most of the cultivated fields.

The total area of Tatum silt loam in this county is 20.8 square miles, and it consists of more or less small irregular-shaped bodies scattered throughout the northeastern, eastern, southeastern, and south-central parts of the county.

About 35 percent of the land is cleared and is in fallow fields, pasture, and cultivated crops. Corn, hay, small grains, and garden vegetables are the principal crops grown. Apple trees do not do well on this soil, as they suffer from drought in dry seasons. Fertilizer treatments are about the same as for the other soils in the piedmont section. Corn yields from 15 to 30 bushels, wheat from 10 to 20 bushels, oats from 15 to 30 bushels, and hay from ¾ to 1 ton an acre. A small amount of fertilizer is applied to corn by some farmers.

Nason silt loam.—The 6- to 10-inch surface soil of Nason silt loam, locally called "gray land," consists of grayish-yellow silt loam with a decidedly floury feel. In wooded areas the topmost inch is slightly darkened by an admixture of organic matter. Beneath this the subsoil, which ranges from 16 to 30 inches in thickness and extends to a depth ranging from 26 to 32 inches, is reddish-yellow or yellowish-red silty clay or clay that is fairly stiff but brittle and crumbles easily into a granular mass. The lower part of this layer becomes more friable and slightly mottled as it passes into the mottled reddish-yellow, yellow, and grayish-yellow friable material below. More or less soft flakes of schist are on the surface and mixed throughout all layers, the quantity increasing with depth. The soil is underlain, at a depth of 30 to 36 inches, by the same rock formation as that beneath Tatum silt loam. Angular quartz gravel is scattered over the surface in most places, and some of the more gravelly areas are separated as a gravelly phase.

The main differences between this soil and Tatum silt loam are in the shallowness of this soil and in the yellowish-red or reddish-yellow color in the subsoil, owing to less thorough oxidization, as compared with the bright-red color of the subsoil of Tatum silt loam.

The relief of Nason silt loam is gently rolling to rolling, and drainage is good. Owing to its texture and structure, the soil does not readily absorb rain water, and it is subject to severe washing, especially on the unprotected rolling areas. The surface soil in areas that have been under clean cultivation for some time is considerably thinned by sheet erosion, and the reddish-yellow silty clay subsoil is exposed in places.

The total area of Nason silt loam is 30.7 square miles. This soil occurs in the same parts of the county as the Tatum and York soils, locally called the schist area, on the northeastern and eastern edges of the county and the southeastern part east of the Davidson soils.

This soil is shallower, more droughty, and inherently poorer than Tatum silt loam. The greater part of it is in forest, consisting of red, black, white, post, and chestnut oaks, pine, hickory, and dogwood, and much scrubby growth and underbrush. In places the land supports dense stands of huckleberry bushes. Corn, hay, and garden vegetables are the main crops grown on the small proportion of cultivated land, and the yields are lower than those obtained on Tatum silt loam. The trees on this soil are not of so good quality and only about half as large as those on the better soils of the pied-

mont section. Pasture and forestry are recommended for the greater part of this soil.

Nason silt loam, gravelly phase.—The gravelly phase is identical in color, texture, and structure of the surface soil and subsoil with typical Nason silt loam. The difference is in the increased content of angular quartz gravel in the gravelly phase. Most of this gravel occurs in the surface and subsurface layers, but a small quantity is in the subsoil.

The relief is similar to that of the typical soil, that is, gently rolling to rolling, and drainage is good. The run-off of surface water is not so rapid as on the typical soil of similar slope, and it is, therefore, not subject to such serious erosion.

Most of the soil of the gravelly phase is in forest similar to that on the typical soil, and less than 15 percent is under cultivation. Corn, hay, and garden vegetables are the main crops, and the yields are low. This soil is closely associated with the Nason, Tatum, and York soils.

York silt loam.—The 4- or 5-inch surface layer of York silt loam, locally called "gray land" or "gray slaty land," is light-colored grayish-yellow silt loam that is almost white when dry. In wooded areas the topmost inch has a darker hue, imparted by decomposed leaf litter from deciduous trees. Beneath the surface layer the material is pale-yellow silt loam 3 inches thick and slightly heavier than the overlying soil. The material in both of these layers has a decidedly floury feel. The subsoil is a yellow to brownish-yellow silty clay that is stiff and brittle but breaks into irregular lumps, which, in turn, easily crush to a fine silty mass possessing a smooth and, in many places, a greasy feel. The subsoil is from 8 to 12 inches thick and contains a few thin fragments of soft schist. This overlies a somewhat lighter textured yellow or brownish-yellow silty clay containing a considerable quantity of partly decomposed schist, which imparts a mottled appearance. On weathering the schist is purplish red or brownish red. Angular quartz gravel, with a maximum diameter of 6 inches, is scattered over the surface in varying quantities. Where the gravel is sufficient to interfere with cultivation, the soil is separated as a gravelly type. As mapped, the depth of the soil varies considerably; in places, even on some of the smoother areas, the partly decomposed underlying schist lies within a few inches of the surface, and in the more rolling areas outcrops of schist are common.

In general, the relief is gently rolling to rolling, and drainage is good. The soil is not retentive of moisture and is inclined to be droughty in periods of light rainfall. Where unprotected by vegetation, the rolling areas are subject to destructive erosion.

The total area of this soil is not large (8.7 square miles). It occurs in the so-called schist belt, mainly in the northeastern part of the county, associated with the Nason and Tatum soils. Only a small acreage has been cleared for cultivation. Most of the farms located on it are small, and the improvements are poor. Corn, hay, small grain, and garden vegetables, the main crops, return low yields.

The tree growth on this soil is the poorest in quality, stand, and size of that on any of the soils of this area. The forest consists of various oaks, pine, hickory, sweetgum, and dogwood, much of it

being scrub oak and pine. In places it supports a good undergrowth of blueberry, blackberry, and huckleberry. The best use of York silt loam is for forestry or for the scant pasturage it affords.

York gravelly silt loam.—This soil is similar to York silt loam in color, texture, and consistence of both the surface soil and the subsoil, the only difference being in the much larger quantity of angular quartz gravel on the surface and in the surface and subsurface soils.

York gravelly silt loam occupies rather large areas running in a northeasterly direction from Blenheim and Woodridge to the Rivanna River. Other smaller areas are closely associated with York silt loam and Nason silt loam.

A small proportion of this land is used for growing subsistence crops and for pasture, but most of it supports a growth of trees of similar species and quality as those on York silt loam. The best use for this land under present economic conditions is for growing trees.

Altavista silt loam.—The 8- to 12-inch surface soil of Altavista silt loam is grayish-yellow silt loam, and the subsoil is yellow friable clay loam, which, at a depth ranging from 25 to 30 inches, becomes lighter in color and mottled with brownish yellow, grayish yellow, and red. In places this lower material is rather heavy textured, and in other places the soil is underlain by sticky gravelly sand. A little water-worn gravel is scattered over the surface and throughout the soil mass. A few areas of Altavista loam, too small to warrant separation, are included with this soil as mapped.

Only 0.8 square mile of this soil is mapped, mainly on the second bottoms, or terraces, of the Hardware River 1 mile southeast of Eolus Mill and northeast of Mount Pleasant School. The soil is developed from old alluvial materials washed from the uplands.

Practically all of this land is cleared and now lies fallow or is being cultivated. Corn, hay, and small grains are the principal crops. The yields are comparatively low but better than the average for the group of soils with light-colored surface soils. Corn, following cowpeas or with applications of manure, yields from 15 to 25 bushels an acre; wheat is usually fertilized with about 200 pounds of a 2–12–2 mixture or 16-percent superphosphate and yields from 8 to 10 bushels an acre.

Orange silt loam.—This soil, locally called "blackjack land," has a 4-inch surface layer of light grayish-brown silt loam, underlain to a depth of 8 to 10 inches by a grayish-yellow or brownish-yellow silt loam containing a few dark-colored concretions in the lower part of the layer. The subsoil begins as a fairly friable brownish-yellow clay loam, but at a depth of about 16 to 18 inches it becomes a heavy plastic brownish-yellow to light-brown clay, and, at a depth ranging from 24 to 26 inches, it rests on the partly decomposed basic rock. Scattered over the surface and throughout the soil mass in places are some rounded boulders. In the northeastern part of the county, one-half mile west of Stony Point and three-fourths of a mile northwest of Rio, a few areas of Iredell soil are included with Orange silt loam as mapped.

Orange silt loam occurs in small irregular areas, mainly in the southern and east-central parts of the county, in the vicinities of Old Dominion and Unionville, on the Nelson County line, and south of Charlottesville. The total area is only 1.9 square miles.

The land is level to gently rolling. Surface drainage is good, but because of the impervious character of the subsoil, internal drainage is slow. About half of the area is cleared, and most of it is used for pasture, and the rest for growing corn and wheat. Corn returns low yields, even when the land is fertilized, and when not fertilized it returns from 10 to 12 bushels an acre. Wheat receives about 200 pounds of 2–12–2 fertilizer or 16-percent superphosphate and yields from 10 to 14 bushels an acre. The principal trees are blackjack, red, white, and post oaks, walnut, cedar, and pine. The land is hard to handle for ordinary cultivated crops. It is in need of artificial drainage, liming, and manuring. Its best use is for pasture and forest.

MISCELLANEOUS SOILS AND LAND TYPES

The miscellaneous group includes alluvial soils (Congaree soil material), stony colluvium (Porters soil material), Davidson clay loam, steep phase, Cecil loam, steep phase, Appling loam, steep phase, Penn silt loam, steep phase, Nason silt loam, steep phase, Porters stony loam, Lehigh silt loam, rough stony land (Porters soil material), and rock outcrop. All together they cover 34.1 percent of the area of the county. Practically all of these soils are too steep, and Porters stony loam is too stony to be used economically for general farming purposes or even for grazing land; therefore, the best use for these miscellaneous soils and land types is for forestry. One exception is the land designated as alluvial soils (Congaree soil material), which can be used advantageously for summer pasture, and, if properly drained, is good for the production of corn and hay. Rough, stony land, by reason of its extremely steep relief and stony character, is the least desirable of these soils and land types for the production of trees. Some of these soils, especially Davidson clay loam, steep phase, Cecil loam, steep phase, and Porters stony loam, are inherently good soils and produce the best trees of any soils of the group. In these soils and land types it is possible to find small areas that are sufficiently smooth to be used for pasture, the production of apples, and some hand-hoed crops.

Alluvial soils (Congaree soil material).—Alluvial soils (Congaree soil material) include first-bottom alluvial soils that are so varied in color, texture, and structure that it is impossible to separate them into types. The soil represents material deposited by streams and washed from adjoining stream slopes. The surface color ranges from grayish brown to reddish brown, and the texture is a conglomeration of fine sand, sand, silt, silty clay, and clay. In places the 8 to 10-inch surface layer is brown silt loam, overlying a stratum of almost white wet fine sand or sand. Here and there the lower part of the soil is brown or dark-brown silty clay or fine sandy clay mottled with rust brown, grayish yellow, and drab, and in other places it is a drab sticky or plastic clay. Sand ridges and bars are numerous. Small areas of Congaree soils too small to separate are included in mapping.

Alluvial soils (Congaree soil material) occur in small narrow disconnected areas, totaling 4.2 square miles, along the first bottoms of many of the smaller streams throughout the county and along the bottom land of the Rockfish River. They lie only a few feet above

normal water level and are subject to overflow with every freshet. Drainage is poor and the soil remains saturated or partly saturated most of the time. A small proportion has been cleared and used for pasture, and some hay and corn are grown. Fair yields of hay are obtained, but corn yields are low. Most of this land supports a cover of willow, alder, water oak, sycamore, birch, and a thick undergrowth of water-loving shrubs.

Stony colluvium (Porters soil material).—This soil has a brown loam surface soil to a depth ranging from 8 to 12 inches, which is mellow and friable and contains a fair amount of organic matter. It is underlain by a light-brown friable loam, which extends to a depth ranging from 40 to 60 inches or deeper. This material thins out on the outer margins where it joins the Porters soils. Scattered over the surface and mixed throughout the soil mass are subangular and rounded cobblestones and boulders of granite, greenstone, and quartzite, ranging from 2 inches to 2 feet in diameter. In places these stones are so numerous over the surface that cultivation is impracticable.

Only a few small areas of this land type occur in the county. These are developed as fan-shaped areas at the foot of the mountains, and in first- and second-bottom positions along the streams flowing from the mountains. The material is both colluvial and alluvial and has moved down by gravity from the steep mountainsides, and moved a short distance by water. This land is well drained, although subject to overflow during heavy rains. It ranges from almost level to gently sloping in relief.

Small areas are cleared and used for the production of corn and garden vegetables. The forest growth is mainly chestnut oak, white oak, beech, cottonwood, walnut, willow, and hemlock.

Davidson clay loam, steep phase.—This phase as mapped represents the steep areas of Davidson clay loam. It is similar to typical Davidson clay loam in both surface soil and subsoil characteristics, texture, structure, and color, but owing to its steep relief, it does not have so thick a subsoil as typical Davidson clay loam. In many places the underlying dark-colored basic rock lies within a few inches of the surface, and loose stone fragments are much more numerous on the surface than on typical Davidson clay loam.

The largest areas of this soil include the steeper parts of Carter Mountain and the Southwestern Mountains, and smaller areas are south of Carters Bridge on the southern slopes of Green Mountain.

Its total area in the county is 35.5 square miles, and practically all of it supports a hardwood forest consisting mainly of white, red, and black oaks, and hickory. In places formerly cleared, farmed, and eventually "turned out," or severely cut over, pines have grown up and form dense stands. Small areas of this soil are being used at present for growing corn, orchard fruits, and pasture, but it is subject to serious erosion where under cultivation. In places where the slopes are not too steep it can be utilized profitably for pasture if care is taken not to overgraze the land. This land produces the best trees of any soil in the group of miscellaneous soils and land types, and under present economic conditions forestry is its best use.

Cecil loam, steep phase.—This soil differs from typical Cecil loam mainly in its steeper relief and depth to the underlying rock of gra-

nitic origin. The color, texture, and structure of the surface soil and subsoil are practically the same as in the typical soil. Stones are scattered over the surface, and granitic rock outcrops here and there; where these features are very prominent, they are designated on the map by symbols. On the scale used in mapping it was necessary to include a few small areas of Cecil loam, Cecil loam, hilly phase, the Appling soil, and, in places, the Davidson soil, that are not quite so steep as land of the steep phase generally. In other places at the higher elevations, Cecil loam, steep phase, is browner and more friable throughout the surface soil and subsoil and approaches the characteristics of the Porters soils, which are formed from the weathering of the same underlying rock but at much higher elevations.

Cecil loam, steep phase, occupies narrow strips along streams and isolated hills, locally called mountains, throughout the central and north-central parts of the county. A total area of 43.6 square miles is mapped in the county, and practically all of it supports a forest growth of white, red, black, and chestnut oaks, pine, maple, poplar, and some dogwood, sourwood, and juniper. A very small acreage is used for orchard fruits, mainly apples, and for permanent pasture. The best use for this land under present economic conditions is for forestry. The growth and quality of the trees are about the same as of those on Davidson clay loam, steep phase.

Appling loam, steep phase.—This phase is similar to typical Appling loam in surface soil and subsoil characteristics, except that it has a thinner subsoil layer. As the phase name implies, it has very steep relief. In places large boulders of granite are exposed on the surface, and rock fragments of all sizes are scattered over many areas of this soil, and, where abundant, they are shown on the map by rock-outcrop symbols. The total area of Appling loam, steep phase, in the county is 20.8 square miles. The larger areas are in the vicinity of Boonesville, north of Free Union, north of Crozet, and west of Mountfair along the border line of the Blue Ridge and Piedmont Plateau, and southeast of Whitehall, and smaller areas are southeast of Nortonsville, and northeast of Broad Axe School.

Owing to its steep relief, land of this phase is not of any great agricultural value. Most of it is forested mainly by various oaks, pine, hickory, some juniper, and dogwood, and a small acreage is used for pasture and corn. North of Crozet, where it borders the Blue Ridge, some of it is used for growing apples. On account of its steep relief, it is subject to serious erosion where cultivated; therefore, its best use is for growing forest trees.

Penn silt loam, steep phase.—This phase has the same characteristics of color, texture, and structure of the surface soil and subsoil as typical Penn silt loam. The main difference lies in the steep relief and in the slighter depth of the soil of the steep phase; in many places the soft partly decomposed red shale comes within a few inches of the surface, and here and there it outcrops.

This soil is unimportant both in extent and agriculturally. Only 5.8 square miles are mapped in the county, and practically all of the land is in forest, consisting mainly of shortleaf pine, old-field pine, oaks, and cedar. Its best use is for the production of trees, although the growth and quality of the trees is not so good as on the steep phases of the Davidson, Cecil, and Appling soils.

All of Penn silt loam, steep phase, is in the southeastern part of the county in close association with typical Penn silt loam. It is developed in more or less narrow strips along streams near Howardsville, west of Warren, southeast of Porters, and southwest of Scottsville.

Nason silt loam, steep phase.—This soil differs from typical Nason silt loam mainly in its more hilly and steeper relief, and generally, a thinner surface soil layer and a shallower subsoil. In many places the underlying schist comes within a few inches of the surface, and outcrops of this material are fairly numerous on the steeper slopes, especially where fields have been in cultivation. A few steep areas of Tatum silt loam and York silt loam are included with this soil in mapping.

It has a steeply rolling to hilly relief, and, where unprotected by forest or grass cover, it is subject to severe surface washing.

The larger areas are west and north of Howardsville, north of Hatton School, and northeast of Keene, and other areas are closely associated with the other soils underlain by schist in the southeastern and eastern parts of the county.

Most of this land is forested by various oaks, pine, cedar, hickory, and dogwood. Practically all of the merchantable timber has been removed, and the quality and present stand of trees is about the same as that on the other soils of this group. Less than 10 percent of the 33.3 square miles mapped in the county is used for cultivated crops. Most of the cultivated areas are small bodies on the hilltops and smoother slopes. Some of the land is used for pasture, but its best use is for forestry.

Porters stony loam.—This soil is similar in color, texture, and structure to Porters loam, but the depth of soil over rock is, in many places, much shallower, and in some places outcrops of hard rock are common. Small to large angular stones of granite and bluestone and some large granitic boulders are scattered over the surface and mixed with the soil. The areas free from stone, included with this soil, are so small that it was impracticable to attempt to separate them on a map of the scale used, and in many places it was somewhat difficult to draw a boundary between Porters stony loam and rough stony land (Porters soil material). Porters stony loam is dominantly steeper in relief and rougher than Porters loam, but smoother than rough stony land (Porters soil material).

Porters stony loam occurs in the Blue Ridge in the northwestern part of the county, the Ragged Mountains in the central part, and the Fan Mountains in the southern part.

Practically all of this soil supports a tree growth of chestnut oak, post oak, white oak, red oak, poplar, hickory, and other hardwoods, but in many places most of the merchantable timber has been removed.

Owing to its steep slope and extremely stony character, Porters stony loam is not suited for general agricultural purposes, but small areas occupying the more favorable relief and containing only a small quantity of stones are used for pasture. Other areas of this soil could be devoted to pasture, and perhaps some isolated areas for growing apples, but by far the greater part should be devoted to forestry.

Lehigh silt loam.—The 8- to 10-inch surface soil of Lehigh silt loam is grayish-brown floury silt loam, grading into a 12- to 16-inch layer of brownish-yellow or drab silty clay that contains infiltrations of grayish-brown material along old root channels from the surface soil. This layer overlies dark-brown to yellowish-brown or drab slightly compacted silty clay material containing here and there a fragment of soft partly distintegrated graphite and hard flaky schist. The subsoil is very tough and hard when dry and rather sticky when wet. Usually the underlying graphitic schist comes within 30 inches of the surface, and in some places, particularly on the steeper slopes, it outcrops.

Lehigh silt loam is very small in extent, only 0.7 square mile being mapped in the county. It occupies three rather narrow strips running in a northeast-southwest direction. The smallest of these is along United States Highway No. 29, north of Charlottesville, where the highway passes along the strike of the formation for a distance of about 1¼ miles. The other two areas are three-fourths of a mile west of Proffit and 1 mile west of Burnleys. Other areas, too small to map, occur intermittently in a southwesterly direction all the way across the county to a point near Johnson Mill.

The relief is rolling to steep. Some of this soil has been cleared, but only a small proportion is cultivated. In wet seasons the crops suffer from excess moisture, and during dry periods they suffer from drought. Most of the land has a forest cover consisting of oaks, ash, pine, cedar, some locust, and sassafras. The best use for this soil is pasture and forestry.

Rough stony land (Porters soil material).—This is a classification given to the steepest and most broken areas of Porters stony loam. Owing to its extreme steepness, natural erosion has kept pace with the soil-forming processes, consequently the soil is very shallow. In places only the surface soil has developed over the granitic bedrock, and in other places the 5- to 7-inch surface soil of brown loam overlies a light-brown, yellowish-brown, and, in places, reddish-brown friable clay. The clay subsoil is in few places developed to a depth greater than 20 to 26 inches below the surface. Practically the whole area is covered by large and small loose rock fragments and boulders, and large outcrops of bare rock are numerous.

Rough stony land (Porters soil material) includes an area of 65.7 square miles. It occurs entirely in the rough mountainous sections of the Blue Ridge in the northwestern part of the county and the mountain range in the southwestern part.

All this steep land is in forest, and this is its best use. The tree growth over a large part of the land is not so good as on the deeper soils of the Porters, Cecil, Appling, and others of the piedmont belt. Formerly chestnut made up the main tree growth, but this is practically all gone, owing to the ravages of blight, and at present chestnut, white, and red oaks, maple, sourwood, and pine make up the principal forest growth. Owing to the generally rugged nature, high position, steep rocky slopes, and inaccessibility of this land, timber is more difficult to cut and remove than it is from Porters loam or the more accessible lower lying soils of the piedmont belt. A large part of this land is now in the Shenandoah National Park.

Rock outcrop.—This designation includes a few small areas of rock that are sufficiently large to be delineated on the map. Many of

these areas represent solid rock, although in some places it is not continuous but includes extremely stony areas mixed with solid rock outcrops. It has no agricultural value, although in some places trees grow in the crevices of the rocks or between the rocks. Most of it is very steep, in some places almost perpendicular walls.

PRODUCTIVITY RATINGS

The soils of Albemarle County are rated in table 5 according to their productivity for the more important crops. The soil types and phases are listed in the order of their general productivity under the dominant current farming practice, the most productive soils being at the head of the table.

TABLE 5.—*Productivity ratings of soils in Albemarle County, V*

Soil [1]	Crop productivity index [2] for—										Gene pro duc tivi grad
	Corn	Wheat	Oats	Barley	Rye	Mixed hay [3]	Clover	Alfalfa	Apples [4]	Permanent pasture [5]	
Davidson clay loam	80	90	60	90	80	100	100	70	100	100	
Congaree silt loam [9]	90	70	50	75	65	100	80	----	----	100	
Congaree loam [9]	90	65	55	75	65	100	80	----	----	100	
Davidson clay loam hilly phase [10]	75	80	55	80	70	90	90	55	100	100	
Wickham fine sandy loam, high-terrace phase.	70	75	60	80	60	75	80	50	90	70	
Wickham fine sandy loam	80	75	65	90	70	85	80	50	----	70	
Cecil loam	60	70	50	70	60	80	85	50	90	85	
Appling loam	65	60	50	65	50	70	70	45	85	70	
Cecil loam, hilly phase [10]	50	60	45	65	55	75	80	45	70	80	
Bucks silt loam	55	60	50	65	55	70	70	35	65	70	
Porters loam	60	60	50	65	65	75	65	45	75	75	
Appling loam, hilly phase [10]	55	60	45	60	50	65	75	40	65	60	
Cecil fine sandy loam	55	55	45	65	55	60	55	35	65	65	
Appling fine sandy loam, hilly phase.[10]	55	55	50	60	50	60	50	40	65	50	
Altavista silt loam	50	50	45	50	55	50	45	30	40	60	
Penn silt loam	50	55	50	60	55	50	55	30	40	50	
Penn fine sandy loam	45	50	40	55	40	50	45	30	40	40	
Tatum silt loam	35	45	35	50	45	50	----	----	30	45	
Orange silt loam	25	25	20	30	30	30	30	----	30	60	
Alluvial soils (Congaree soil material) [9].	25	----	----	----	----	60	40	----	----	80	
Davidson clay loam, steep phase	----	----	----	----	----	----	----	----	80	90	
Cecil loam, steep phase	----	----	----	----	----	----	----	----	60	70	
Lehigh silt loam	30	45	35	45	45	40	35	25	----	40	
Stony colluvium (Porters soil material).	20	----	----	----	----	40	40	30	----	50	
Porters stony loam	----	----	----	----	----	----	----	----	65	65	
Nason silt loam	20	30	30	40	40	35	----	----	----	40	
Nason silt loam, gravelly phase	20	30	30	40	25	35	----	----	----	40	
York gravelly silt loam	20	25	30	35	35	30	----	----	----	30	
York silt loam	20	25	20	30	30	30	----	----	----	30	
Appling loam, steep phase	----	----	----	----	----	----	----	----	40	40	
Penn silt loam, steep phase	----	----	----	----	----	----	----	----	40	40	
Nason silt loam, steep phase	----	----	----	----	----	----	----	----	----	----	
Rough stony land (Porters soil material).	----	----	----	----	----	----	----	----	----	----	
Rock outcrop	----	----	----	----	----	----	----	----	----	----	

[1] The soils are listed in the approximate order of their general productivity under the average current practices, the most productive first.

[2] The soils of this county are given indexes that indicate the approximate average production of each crop in percent of the standard of reference.

[3] Mixed hay includes mixed timothy and clover, grass hays, and legumes to which the standard yield of 2 tons is applicable as a reference.

[4] The standard of reference used for apples in this county is 300 bushels per acre. This standard refers to yields obtained by fertilization.

[5] These indexes are only comparative and not based on a standard. Because of limited data, they are only estimates.

[6] This classification indicates the comparative general productivity of the soils under dominant current practices that include the use of fertilizers. Refer to the text for further explanation.

[7] This is a general classification to
ing, grazing ,or forestry uses. In t
considerations, such as the pattern o

[8] General farming in this county
fruit and garden vegetables.

[9] Congaree soils as mapped, descri
No fertilizers are used on these soils

[10] These indexes refer only to the s
hilly phases. The steeper parts ar
than for the smoother soils is comm

The productivity of each soil for each crop is compared to a standard of 100 in the columns headed "Crop-productivity index." A rating of 25, for example, indicates that the soil type is one-fourth as productive for the specified crop as is a soil with a rating of 100. A standard of 100 is meant to represent the approximate average yield of the crop obtained without the use of amendments on the more extensive and better soils in the region where the crop is principally grown. Small areas of unusually productive soils or soils given amendments such as fertilizers or irrigation may yield larger crops than the standard, and under such conditions ratings above 100 are given.

The following tabulation sets forth the acre yields that have been established as standards of 100. These figures represent the average long-time yields of crops of satisfactory quality on the better soils without the use of amendments.

Crop:		
Corn	bushels	50
Wheat	do	25
Oats	do	50
Barley	do	40
Rye	do	25
Apples (fertilized)	do	300
Mixed hay	tons	2
Alfalfa	do	4

The principal factors determining the productivity of land are generally said to be climate, soil, slope, drainage, and management. Consideration must be given to all of these factors in setting up productivity ratings for soil types, and an attempt made to evaluate their influence. Crop yields over a long period offer the best available summation of the combined effect of these factors, and they are used as guides in the establishment of ratings, wherever they are available. Data on crop yields, especially by soil types, are decidedly inadequate, and so the ratings as given here should be considered largely as estimates that are based on observations in the field, interviews with farmers, census reports, and cooperative experimental work with the State agricultural experiment station.

Current practices are considered to include the ordinary application of commercial fertilizers to corn and wheat on all the soils except the Congaree during a rotation of corn, wheat, and grasses. Orchards are commonly fertilized each year. Of course, actual farming practices as carried out on the individual farms may vary with each soil type and with each farmer. The ratings as given are for the estimated productivity under what has been considered prevailing practice for the soil type in question.

In the column "General productivity grade," the soils are rated according to their general productivity under dominant current practices. The general productivity grade is based on a weighted average of the indexes for the various crops, using the average acreage and value of those crops in the county as a basis. The weights given each crop index were (with a few exceptions) as shown in table 6. If the weighted average is between 90 and 100, the soil type is assigned a grade of 1; if between 80 and 90, a grade of 2, and so on. Since it is difficult to measure or to express mathematically either the exact significance of a crop in local agriculture or the importance and suitability

of given soils for particular crops, these weightings were in certain instances used only as guides for the relative placement of the soil.

TABLE 6.—*Percentage weights given to crop indexes to arrive at the general productivity grades shown in table 5*

Soil group	Corn	Wheat	Oats	Barley	Rye	Mixed hay	Clover	Alfalfa	Apples	Pasture
Soils used for general farming	30	10	5	2	3	10	5	5	20	10
Soils largely used for apples	5	2	------	------	------	10	5	5	50	10
Soils largely used for corn and pasture	50	------	------	------	------	15	5	5	------	20
Soils used to a limited extent for general farming; otherwise frosted	30	10	5	2	3	10	5	5	10	20
Soils used in part for apples; otherwise in pasture and forest	------	------	------	------	------	------	------	------	10	25
Soils used for pasture and forest	------	------	------	------	------	------	------	------	------	25

The column "Land classification" summarizes in a simple way the productivity and use capabilities of the various soils by placing them in a few groups on the basis of their relative suitability for cropland, pasture, and forestry.

Productivity-rating tables do not present the relative roles that soil types play in the agriculture of a county, but rather indicate the productive capacity of each individual type. Total agricultural production of a soil type depends on its extent and geographic distribution quite as much as on its actual productivity.

Economic considerations play no part in determining the crop-productivity indexes, which refer to production of each crop or group of crops. The indexes, therefore, cannot be interpreted into land values except in a very general way. The value of land depends on distance from market, the relative prices of farm products, and a number of factors in addition to the productivity of the soil.

LAND USES AND AGRICULTURAL METHODS[6]

The agriculture of Albemarle County can be divided into two main classes—general farming and apple and peach production—which follow closely the various soil formations of the county. General farming is practiced on practically all of the soils of the county, with the exception of the steep mountain soils, and the apple and peach orchards are more or less confined to the high upland soils of the Davidson, Cecil, and Appling series.

The soils of the Davidson series are the best soils for general farming in the county, although the Cecil and Appling soils, derived from granite, are well adapted to the production of general farm crops. The Cecil and Appling soils, mainly the fine sandy loams, developed from arkose sandstone, are not so productive or so inherently fertile as the soils derived from granite. Their loose subsoils and porous structure greatly increase the leaching of plant nutrients, and more care and effort are required to bring these soils up to and maintain them in an economic state of productivity.

[6] Information for this section was furnished by T. B. Hutchinson, head, Agronomy Department, W. H. Byrne, associate agronomist, Extension Division, and D. A. Tucker, assistant horticulturist, Extension Division, Virginia Polytechnic Institute; and T. O. Scott, county agent.

The soils of the Davidson series are higher in calcium than any of the other soils in the county, although they are relatively deficient in potash. By the application of commercial fertilizers and the use of cover crops in rotations, the Davidson soils can produce and are producing crops that give the greatest return for the money invested, and these soils have a higher sale value than any of the other soils in the county.

The soils of the Davidson, Cecil, and Appling series are all low in organic matter, but the texture and structure of all these soils are such that they respond readily to and hold improvements.

Because general farming is practiced on all the agricultural soils, the soils of the Davidson, Cecil, Appling, Bucks, Altavista, and Wickham series and the smoother areas of the Porters soils can be classed together in one agricultural group; and the management, crop rotations, and, on most of these soils, the fertilizer requirements are the same.

Crop rotations applicable to soils of this group are: A 3-year rotation, such as first year, corn; second year, wheat; third year, clover and grasses; and a 4-year rotation of corn, wheat, and 2 years of clover and grasses. These rotations have been found very satisfactory if the clover and grasses are not cut too often or grazed too heavily. On the poorer soils one cutting during a season is enough, but on the better soils two cuttings may be made, depending on the season.

Two and three-year rotations of small grains and clover give very satisfactory results, especially on the steeper and shallower soils. As erosion is one of the chief problems on the Cecil and Appling soils, a 2- or 3-year rotation that excludes a row crop will tend to reduce the washing of the surface soil and at the same time will increase the organic matter in the soil and its water-holding capacity.

A 2-year rotation of small grain followed by clover and grasses, or a 3-year rotation of small grain followed by 2 years of clover and grasses, gives satisfactory results. Barley is a small grain that can be used in the above rotation and is a very good substitute for corn in feeding livestock.

Soils of the Davidson series, and also soils of the Cecil and Appling series developed from granite, are adapted to the production of alfalfa when well supplied with organic matter, calcium, phosphorus, and potash. Alfalfa also does well on the deeper areas of the Bucks soils when the mineral elements and organic matter are liberally supplied.

On the Congaree soils, 3- and 4-year rotations are sometimes followed, although the general practice is to grow corn and hay crops entirely. Wheat is not well adapted to these soils of the river bottoms, and in most places corn and hay are grown, with little attention paid to rotations. Corn is cropped continuously for several years on many farms, and on other farms these bottom soils are used entirely for pastures and hay crops. The Congaree soils are inherently the most fertile and strongest, and continuous cropping to corn may be followed when proper management methods are practiced. If these soils are frequently subjected to overflow from the stream or river, they should be placed in permanent pasture.

The soils of the Tatum, Nason, and York series are not commonly used for cultivated crops, but are in cut-over forests consisting chiefly of scrub (spruce) pine, and a very poor stand of white, scarlet, and chestnut oaks, hickory, and some maple. The shortleaf pine, a much more desirable species, also grows wherever seed trees were left in the original forest. These soils are not adapted to apple or peach orchards, but on the deeper areas of the Tatum soils pastures can be maintained successfully. Owing to their inherently low fertility and also to their droughty condition caused by the shallowness of the surface soil and subsoil, it is not advisable to use a crop rotation containing corn. When necessary to cultivate any of these soils, liming and heavy applications of fertilizer are essential, and only shallow-feeding crops should be grown. A 2-year rotation of (1) small grain and (2) clover and grass, or a 3-year rotation of small grain and 2 years of clover and grass, should give the best results. Many areas of these soils are too shallow to be used for anything but forests.

The soils of the Bucks and Penn series are used chiefly for general farming, and some small orchards are on them. They are naturally low in all important plant nutrients, yet they are very desirable soils for general farming purposes because their relief is smoother than many of the other soils and their texture and structure are such that they can be easily built up and will retain improvement. The Penn soils are usually considered droughty, owing to their shallow subsoil; but Bucks silt loam as mapped has a deeper development of subsoil than the Penn soils, and its water-holding capacity is sufficient. The crop rotations that can be used on this soil with good results are the 3- or 4-year rotations. The relief is not steep, and erosion is not a serious problem; therefore, the 3-year rotation is very suitable, as legumes are grown more frequently, and nitrogen is one of the important requirements of this soil.

Such soils as Davidson clay loam, steep phase, and Porters stony loam are not cultivated, owing to their steep relief, and are usually left in forest, although some areas are cleared for mountain pastures and ranges, and in some places orchards have been planted on these soils. The returns from most of the pastures have proved unsatisfactory, and many of them are reverting to forest, which will very probably prove to be the most economical use for soils of such steep and rough configuration. The difficulty of spraying, cultivating, and harvesting the fruit in orchards planted on soils of steep relief puts such orchards in the marginal class and, with the added danger of late freezes at high altitudes, makes the operation of orchards on the steeper soils very risky from an economic standpoint.

Leaching and erosion are the principal factors causing the loss of the plant nutrients from the soil. The incorporation of organic matter in the soil by growing and turning under green-manure crops is important in checking soil leaching, and many farmers add organic matter by growing winter cover crops and by using crop rotations in which leguminous crops are turned back into the soil. Many of the soils have been affected by accelerated erosion, and gullies have formed in many places. To control erosion, some of the farmers are terracing their land, and a few check erosion by deep plowing

and by growing cover crops. Strip farming in connection with terracing is recommended.

Practically all of the soils are slightly to strongly acid, and most of the soils that have not been limed are too acid for the most economical production of general farm crops. Sufficient lime should be added to the soil on which rotated crops are grown to bring the soil up to a pH value of 6. Table 7 gives the results of pH determinations of samples of several soils from this county.

TABLE 7.—*pH determinations of samples of several soils from Albemarle County, Va.*[1]

Soil type and sample No.	Depth	pH	Soil type and sample No.	Depth	pH
Davidson clay loam:	*Inches*		Cecil loam:	*Inches*	
212501	0–4	6.3	212517	0–4	4.3
212502	4–28	5.3	212518	4–6	4.5
212503	28–40	5.1	212519	6–9	4.6
212504	70+	5.1	212520	9–36	4.6
Penn silt loam:			212521	36–48	4.7
212505	0–6	5.6	212522	80+	4.6
212506	6–28	4.7	Lehigh silt loam:		
212507	28–36	4.8	212523	0–8	5.0
212508	40+	4.9	212524	8–24	4.6
Tatum silt loam:			212525	24–30	4.8
212509	0–3	4.0	212526	30+	4.7
212510	3–8	4.6			
212511	8–26	4.9			
212512	26–40	4.8			
212513	40+	5.0			

[1] Determinations made by E. H. Bailey, Bureau of Chemistry and Soils, by the hydrogen-electrode method.

Usually an initial application of the equivalent of 2 tons of ground limestone an acre, followed by the equivalent of 1 ton of ground limestone every 5 or 6 years, will keep the pH value of the soil at about 6.0. Although corn and small grains will do well with a pH value of 5.5, it is essential to have a pH value of at least 6.0 if maximum results with the clover in the rotation are to be obtained. Where alfalfa is to be grown, sufficient lime should be added to the soil to raise the reaction to at least pH 6.5. The equivalent of 3,000 to 3,500 pounds of ground limestone is needed to change the reaction of most soils of the loam, silt loam, and clay loam types 1 pH unit of value.

The proper fertilizer to be used will depend on the type and fertility of the soil, the kind of crops to be grown, and whether or not unleached manure is used. For corn, small grains, and grass hays, the fertilizers found to give the best results are 0–20–0, 0–14–6, and 4–12–4. If unleached manure has been applied in sufficient quantity, 0–20–0 fertilizer can be used. If a legume crop has been turned under, the 0–14–6 mixture can be used; and if neither manure nor a legume crop is present, the complete mixture, 4–12–4, should be used. For annual legumes 0–20–0 or 0–14–6 is advised, and for alfalfa 0–20–0, 0–14–6, or 4–12–4 has proved successful. A general rule suggested by the Virginia Agricultural Extension Division is that at least 200 pounds of fertilizer to the acre each year be used in the rotation. It does not make much difference just how the fertilizer is distributed in the rotation. In a 4-year rotation 200 pounds can be applied on corn, 400 pounds on small grain, and 200 pounds on clover and grasses when seeded in the spring; or 200 pounds can

be applied each year of the 4-year rotation, which will total 800 pounds for the 4 years. In a 3-year rotation, where 600 pounds is needed, the same distribution should be followed, such as 200 pounds on corn, 300 pounds on small grains, and 100 pounds when seeding clover and grasses. The foregoing fertilizer recommendations are applicable to the soils of the Davidson, Cecil, Appling, Bucks, Altavista, and Wickham series and other soils that are in an average state of productivity.

On the soils of the Penn, Tatum, Nason, and York series the quantity of fertilizer should be increased 25 percent over the quantities given above; and very heavy applications of manure would be beneficial to these soils, as they are all very low in organic matter.

When seeding alfalfa on soils that have not had a liberal application of manure, the equivalent of not less than 600 pounds an acre of 4–12–4 fertilizer should be used. If manure has been used, an equal quantity of 20-percent superphosphate or 0–14–6 should be used, depending on the quality of the manure applied.

The heavier soils, such as Davidson clay loam, hilly phase; Cecil loam; Cecil loam, hilly phase; and Appling loam, hilly phase, are the soils best suited for permanent pastures. Permanent pastures containing bluegrass do well on good deep soils but are not so successful on the shallower soils. A grass mixture for permanent pastures, which is well adapted to the better soils, is 14 pounds of orchard grass, 8 pounds of bluegrass, 3 pounds of redtop, 5 pounds of lespedeza, and 2 pounds of white Dutch clover. On soils that are shallow, such as those of the York, Nason, and Tatum series, a mixture of 3 pounds of redtop, 12 pounds of orchard grass, 5 pounds of Korean lespedeza, and 5 pounds of Kobe lespedeza will bring very good results.

For the Congaree soils, which are subject to frequent overflow and are not so well drained, the following grass mixture will bring good results: Six pounds of redtop, 6 pounds of alsike clover, 6 pounds of Korean lespedeza, and 6 pounds of timothy; or, in place of the redtop and timothy, 14 pounds of orchard grass can be used.

The general recommendation for pasture fertilization is to apply 1 ton of ground limestone, or its equivalent, and the equivalent of 300 pounds of 0–14–6 fertilizer an acre each year for 3 or 4 years, and afterward to repeat the applications whenever the grass shows the need of them. Where a good cover of the better grasses is not present, good results cannot be expected unless grass seed is sown.

Of the many varieties of corn, the ones best suited to the soils of this county in the large-eared white class are Casey Purebred (the best-liked variety), Boone County White, and Johnson County White. In the large-eared yellow varieties are Reid Yellow Dent and Golden Queen (early maturing). In the silage varieties, Eureka, Virginia Ensilage, and Pamunkey are the more popular. The recommended varieties of wheat are: Bearded—V. P. I. 131 and Fulcaster; smooth—Forward, Leap (Leap Prolific) and Leapland. The oats varieties recommended are Winter Turf (Virginia Gray Winter), Tech (V. P. I. No. 1), Red Rustproof, Lee, Fulghum, and for late seeding, Burt, which is a quick-growing variety. The only variety of rye recommended is Abruzzi. Barley varieties recommended are Tennessee Winter (bearded) and Virginia Hooded. The sources recom-

mended for seed of medium red clover are Tennessee, Virginia, Maryland, Ohio, and Michigan, and for alfalfa, Kansas, highland Utah, and Canada (Canadian Variegated). Grimm alfalfa is not so satisfactory as the common varieties.

The growing of apples and peaches is one of the important agricultural pursuits of Albemarle County, and the orchards are located chiefly on the soils of the Davidson, Cecil, and Appling series and the smoother soils of the Porters series. These soils are well adapted to orchards, and on the smoother land they show good growth and development. Some orchards are located on areas of the steeper soils and suffer considerably from lack of moisture and attention, as such soils are shallower and their steepness makes spraying, cultivating, and pruning difficult.

In planting an orchard, it is advisable to plant on soils that are suitable for cultivation. Turning under one or more cover crops on land selected for an orchard site will greatly increase the chances of the trees getting a good start. The orchard should be clean cultivated and intercropped with small grains and hay crops until the trees are 3 or 4 years old; but it is not advisable to plant crops closer to the trees than 4 feet. After the fourth year a good cover crop should be maintained, and this, with contour plowing and cultivation, will minimize erosion. Lespedeza and soybeans are used as a cover crop with a good thick sod as the final development. The cultivation used on cover crops and other crops grown in the young orchard will be sufficient cultivation for the trees.

The first year (the year the orchard is planted), no fertilizer is used unless the trees are growing poorly; then one-fourth pound of nitrate of soda is applied to each tree. The cover crop is given a complete fertilizer at the rate of 200 to 300 pounds an acre. After the first year the trees are fertilized with one-fourth pound of nitrate of soda, or an equivalent quantity of some other nitrogenous material, for each year of the tree's life, up to 3 pounds for peach trees and 8 pounds for apple trees. Fertilization and the quantity of fertilizer will vary with the growth of the trees. The fertilizers are usually applied in the spring. A split application of one-half in the fall and one-half in the spring can be used; otherwise the full application should be made in the spring. Another method is to apply from 300 to 400 pounds of 0–14–6 an acre to the cover crop and apply the nitrogen in a wide band around the trees.

As a constant and uniform supply of moisture is essential to the growth and production of orchard fruits, any material that can be used as a mulch should be so used. Flooding irrigation is very beneficial in dry years, but owing to the sloping relief of many orchards, this means of supplying water to the trees is not practicable. The pH value of the soil for apple and peach orchards should be maintained at 6.3 to 6.8.

In past years the culture of grapes was an important branch of agriculture, and the sections along the Rivanna River were admirably adapted to their production. At present, however, their production on a large scale is not recommended, owing to economic factors. New plantings should be principally of the wine-grape varieties, and the acreage should be increased as demand justifies. Grapes are produced well on any soils adapted to peach orchards. When fertilized with from 500 to 600 pounds an acre of 5–8–5 or 4–12–4, good yields

are obtained, although on the lighter textured sandy soils it is sometimes necessary to increase the fertilizer application to as much as 1,000 pounds an acre.

Such small fruits as strawberries, raspberries, and dewberries are well adapted to the terrace soils, such as the Wickham and Altavista soils along the James River, although at present very little berry culture is carried on. On all small fruits the fertilizers should be applied in the fall, and about 100 pounds of nitrate of soda, or its equivalent, should be applied in the spring about the time the leaves are coming out. Lime should be applied at intervals in order to maintain the soil in a productive state. If the soil becomes too acid the yields of small fruits are greatly reduced.

The varieties of apples adapted to Albemarle County are Yellow Newtown (Albemarle Pippin), Winesap, Stayman Winesap, Delicious, Grimes Golden, Golden Delicious, and Bonum. Ben Davis and York Imperial are grown principally as pollinizers. The peach varieties are Elberta, Champion, Belle (Belle of Georgia), J. H. Hale, and Carman. In most of the county it is unwise to plant a peach orchard at an elevation of less than 800 feet. The grape varieties that have proved successful are Concord, Norton, Ives, and Cynthiana.

In many parts of the county are large areas of poor soils or of soils that, though inherently good, are so hilly and steep or so stony that they are unsuited for agricultural purposes under present economic conditions. Besides these larger areas, nearly every farm has some such areas. Timber should be grown on such land, and, where properly managed, it will contribute to the farm income. In subsequent pages the forests are discussed in relation to the soils and recommendations are given as to their proper management.

FRUIT GROWING IN ALBEMARLE COUNTY[7]

Virginia has long ranked third among the commercial apple-producing States of the United States, being exceeded only by Washington and New York. The 1935 United States census reported 7,683,831 producing trees in New York and 6,723,702 in Virginia, producing respectively 13,555,726 and 8,591,169 bushels.

Albemarle County is one of the older commercial apple-growing counties in Virginia. In 1773 Thomas Jefferson had some nursery stock growing near Charlottesville. About 1790 a nursery was conducted in the county by a Mr. Rawles. About the middle of the eighteenth century a Mr. Dollings had a nursery planting in the vicinity of Batesville (*5*). Near Afton are a number of Yellow Newtown trees said to be 100 years old, and in the Boas orchards near Covesville, and also in the Sutherland orchard, are trees of the same variety about 65 years old. In the last-named orchard the trunks of the trees have a circumference ranging from 64 to 89 inches.

The 1935 census reported 512,979 trees of bearing age and 50,818 trees of nonbearing age in the county. In number of trees the county was surpassed only by Frederick County, and in production, only by Frederick and Augusta Counties. The county ranks first in the State in the production of Winesap and Yellow Newtown. Other va-

[7] Information for this section was furnished by A. T. Sweet, of the Bureau of Chemistry and Soils, and F. E. Merrifield, assistant county agent of Albemarle County.

rieties grown are York Imperial, Stayman Winesap, Ben Davis, Delicious, Arkansas (Mammoth Black Twig), Grimes Golden, Black Ben (probably Gano), Jonathan, Bonum, King David, and Rome Beauty. The Winesap has been heavily planted in recent years.

Commercial apple growing is carried on largely in the higher portions of the Piedmont Plateau part of the county and in the mountains and foothills, also to some extent in the higher valleys and small coves. The most extensive plantings are in the vicinities of Crozet, Afton (Nelson County), and Covesville; but large plantings are also near Batesville, Greenwood, North Garden, Arrowhead, Heards, Charlottesville, and a few other places. Climatic and soil conditions in this county are believed to be fairly representative of a much more extensive apple-growing region in the counties to the north and south on the Piedmont Plateau and on the eastern slope of the Blue Ridge.

Temperature is a principal, if not the controlling, factor in apple growing in this county. No sharply defined belt or zone exists in which apples are entirely safe from injury from frost or from freezing temperatures, but there is a "thermal belt" in which danger from such injury is much less than in other parts. This belt is limited on the one side by the higher parts of the Blue Ridge, in which the principal danger is from freezing in early winter or early spring, and on the other side by the lower parts of the county, in which the principal danger is from killing frost late in the spring. Injury from the last-named cause is believed to be much the greater.

Frost injury is closely associated with air drainage or lack of it. High coves and slopes in which the air movement is good are much more free from injury by frost than are the lower slopes, valleys, and level areas. In many orchards in the lower parts of small valleys are "frost pockets," in which injury is usually greater than in other parts of the orchard. The transition from an area in which frost injury occurs to one in which it does not is sharp in many places, and the line of separation is more or less permanent. For this reason, in many orchards the largest trees, which usually grow at the foot of the slopes or in small valleys where the soil is deepest and moisture most abundant, do not produce the most fruit. The injury in such places is often due to frost, but in places it may also be due to conditions unfavorable for pollination. In places there are within the apple-producing belt comparatively large areas of good soil that are unsuited for apple growing because of their position where the frost hazard is too great. Limits of the zone in which the danger from freezing or from frost is least are said to be indicated in a general way by the upper and lower limits of fog, which at times fills the coves and rests on the slopes. Above the upper limits of the fog the danger of injury is from freezing, and below it, from late frost. Owing to temperature limitations, many orchards are said to be marginal, in that their production is so uncertain and variable that they are unprofitable, and yet, under favorable weather conditions, they produce yields that tend to demoralize the market to the extent that all growers suffer.

The second important factor in apple growing in this county is moisture, or the conservation of moisture. The mean annual precipitation is between 40 and 45 inches, which is an abundance of

moisture, if well conserved, for any orchard; yet many orchards suffer from drought. With the exception of orchards planted in the small coves and near the foot of the slopes where the soil holds an accumulation of moisture, practically all the orchards suffer more or less from drought.

Soil, also, is an important factor in apple production. The texture, structure, consistence, and depth of the soil mass determine, in large measure, the moisture conditions and the adaptability of the soil to the production of apples. The soils in this general region range from loam to clay loam in the surface layers, and from friable clay loam to rather heavy stiff clay in the subsoil layers. On the Blue Ridge the dominant soils are Porters loam and Porters stony loam, but only comparatively small areas of these soils have been used in apple growing, owing to the steepness of relief and the stony character of the soils. These soils inherently are fertile and possess good physical characteristics, as they are friable throughout the soil mass. The Yellow Newtown and Winesap, which have a wide reputation for flavor and color, do especially well on these soils. It is reported that the best grade of apples is produced on the soils of the foothills of the Blue Ridge above the so-called frost-line.

At the foot of the mountains and extending out over the higher portions of the adjacent Piedmont Plateau, Cecil loam and Cecil loam, hilly phase, together with Appling loam, constitute an important group of soils that are well suited to growing apples. Davidson clay loam, in the Piedmont Plateau, also is a desirable soil for apple growing. This is a dark-red clay loam, underlain by a maroon or deep-red heavy smooth clay. These red clay soils seem to hold moisture better than the soils that are underlain by a yellowish-red or light-red clay. The red soils, where the surface soil has been removed by erosion, will not grow trees so rapidly nor produce fruit so well as where the surface soil is a good clay loam.

Terracing has been followed to a very small extent, but it is believed that terracing in places could be used to very good advantage. By spacing the terraces at approximately the right distance for planting trees, and planting the trees immediately above the terrace, greater depth of soil and increased moisture supply would be obtained.

Orchards on very steep and rocky slopes are considered marginal because of increased cost of maintenance. Extremely steep and rocky slopes, even in the zone of least frost damage, are questionable for apple tree planting under present economic conditions.

The county agent states that most of the fruit growers mix their own fertilizer for orchards. Cyanamid, sulfate of ammonia, and nitrate of soda are used as sources of nitrogen. One part of nitrate is used to two of phosphate, and this mixture is applied at the rate of 200 to 600 pounds an acre. Some growers use sulfate of ammonia in the fall and nitrate of soda and phosphate in the spring. The general practice, however, is to fertilize in the spring.

The principal pests attacking apple trees are San Jose scale, scab, codling moth, curculio, brown rot, and bitter rot. The growers are mainly dependent on sprays, and those who follow the schedule with timely and careful applications usually harvest a large proportion of good fruit.

Albemarle County is one of the largest and best peach-producing counties, and years in which a profitable peach crop is not produced are very few. This fruit requires as much attention as apples, but different practices are necessary in spraying, cultivation, and fertilization.

TIMBER GROWING IN ALBEMARLE COUNTY [8]

Timber growing is an important land use in Albemarle County. Although most of the soils are inherently productive, steepness of slope, rock and stone content, and past abuse of the land make large areas unsuited to agricultural use. Erosion has already made serious inroads on practically all of the soils, and if agriculture is to remain profitable this must be stopped. Sheet erosion has removed from 3 to 7 inches of surface soil from much of the open land in the space of a generation or two, and gullies, measured in feet, are common. Obviously, this should not continue.

Both cultivation and pasturage are recognized as more intensive uses for land than is the growing of timber. Where, for any reason, however, cultivation or pasturage results in wastage, need for a change is indicated. Terraces, cover crops, and grasses can be used on moderate slopes, but on steep and badly abused areas forests usually offer the only permanent solution.

The forest growth may be grouped into three rough types: Bottom-land hardwoods, upland hardwoods, and pines in pure stands. In addition, more or less extensive areas of open land, for one reason or another, have failed to reforest satisfactorily. Some are bare and eroding badly; some are protected by grass, brush, and wood growth; and some are dotted with scattered trees; but all are idle land, and, therefore, unproductive.

The bottom-land hardwoods are confined to narrow strips of alluvial soils bordering streams, but because these soils are highly productive they have been largely cleared. Ash, tuliptree (yellow poplar, tulip poplar), and walnut are the more valuable species, but they are outnumbered by birch, sycamore, maple, elm, and other moisture-loving species of lesser value. Because of the limited areas remaining, bottom-land hardwoods are of minor importance.

The upland hardwoods are a remnant of the original forests. These consisted of a mixture of virtually all of the hardwood species native to this region, with various admixtures of pines. In the mountain slopes and hollows, hemlock and white, scarlet, southern red, and chestnut oaks, are the characteristic species. Chestnut was formerly abundant but has largely disappeared before the ravages of the blight. Other important species are the hickories, locust, tuliptree, black oak, post oak, walnut, white pine, shortleaf pine, scrub pine, and hemlock.

The pine stands are an artificial or temporary condition—the result of severe fires or abandonment of worn-out farm land. This ability of pines to reclaim such areas is due to three factors—the prolific seeding capacity of pine trees, the light weight and large wing of the pine seed, which enables it to travel long distances on the wind, and the ability of pines to thrive on land so poor that most hardwoods would starve.

[8] This section was prepared by Wilbur O'Byrne, extension forester, Virginia Polytechnic Institute.

Little if any of the original forest growth remains. The bottom lands and better uplands were cleared for agriculture. Most of the remaining forest has been culled for the better trees, leaving behind the less valuable species and the culls to occupy the ground and furnish seed for succeeding crops. As a result, much of the present woodland is little better than a weed patch.

In addition to the culling process, much of the farm woodland has been overgrazed until it has lost most of its value for any use. Shade prevents the grass from forming a sod, so the land provides little feed, and much washing of the soil results. Browsing animals compact the soil, devour the young growth, and injure the exposed roots so that disease finds its way into the trees. The result is no forest, no grass, and, eventually, no soil and no value. If an area has real pasture value, it should be cleared and seeded to grass before the soil has had time to wash away; if not, livestock should be fenced out so that the forest may remain productive.

Although a large number of soils are recognized in this report, those that have an important bearing on forest production may be grouped under four heads: (1) Those from basic rocks, represented by the Davidson series; (2) those from granitic rocks and arkose sandstone, represented by the Cecil, Appling, and Porters series; (3) those from Triassic rocks, represented by the Bucks and Penn series; and (4) those from schist, represented by the Tatum, Nason, and York series.

The Davidson soils are strong soils, and, where sufficiently level, are generally in cultivation. Where they become rolling, hilly, and steep, cultivation gives way to pasture and finally to forest; but for all three purposes they are first-class soils. The forest is almost entirely hardwood except where erosion has been severe, and here pines (usually scrub pine) form dense stands. Walnut is the characteristic tree, as it is encountered more frequently and develops better on the Davidson soils than on any other soil in the county, unless it be some of the alluvial soils along the streams.

The Davidson soils are subject to sheet erosion, but gullies do not form until the surface soil has been washed away. Because of their productive capacity, they remain essentially agricultural wherever they can be successfully guarded against erosion. When reforestation seems desirable, shortleaf pine is recommended, (1) because pines are more dependable than hardwoods for reforesting land that has been worked long enough to alter its character, and (2) because shortleaf is the most desirable pine for planting on heavy soils.

The soils developed from granitic materials make up the largest general-farming group in the county. The Cecil soils [9] are the more important, both in area and in productive capacity. The Appling soils are more extensive in the rough country near the Blue Ridge, and the Porters soils are confined to small areas near the tops of the mountains. The soils of all three series are essentially general-farming soils, but the Cecil and Appling soils are subject to serious erosion unless carefully handled. Most of the orchards in the western part of the county are on the Porters, Cecil, and Appling soils.

The forests, although largely of hardwood, contain a much larger proportion of pine than do those on the Davidson soils. Shortleaf

[9] Included in the Cecil and Appling series are the soils developed from arkose sandstone.

pine was the more numerous in the original growth, but, because of its greater value, it has been almost exterminated over large areas, whereas the scrub pine, which was left behind because of its lesser value, has taken over most of the abandoned fields. Shortleaf pine is recommended for reforestation except on northerly slopes with good soil depth, especially in the mountains, where white pine should do equally well.

The Bucks and Penn soils have been more nearly cleared than any other of the principal soils, and, although not so fertile basically as some of the others, they lie well, hold improvement, and so are essentially agricultural soils. In forest production they are intermediate, being superior to the Tatum, Nason, and York soils, but not so good for hardwoods as the Davidson soils, and not so good for pines as the Cecil and Appling soils. Erosion has not been so severe as it has on most of the other agricultural soils, because of the moderate relief, but sheet erosion is active in many places. Where reforestation is indicated, shortleaf pine is recommended.

The Tatum, Nason, and York soils are shallow, subject to severe erosion, and have been sparingly cleared. Tree growth is slow, with the trees relatively short and limby. The composition of the forest is similar to that found on the Cecil soils, except that scrub pine is more numerous and shortleaf less numerous. The best use for these soils is probably to include them in large units for the production of timber and game. Shortleaf pine is recommended for planting, as it is probably the most valuable tree available and has been cut severely. The other species seem to be amply able to take care of themselves.

Of the factors that enter into the question of the best use of land, erosion and productive capacity deserve special attention. Terracing and other approved practices make possible the cultivation of fairly steep slopes, provided the productivity of the land and the value of the products justify the expense. Where the value of the products does not justify such intensive handling, forests can always be depended upon. An important thing is to prevent erosion, and the most dependable indicator of erosion is the condition of the surplus rainfall as it leaves the field or farm. If the run-off water is clear, erosion is under control; but if it is muddy, further steps are necessary.

Timber growing is an extensive use for land and will, as a rule, be confined to areas where other effective erosion control is uneconomic, and to areas of poor and worn-out soils where the more intensive uses would be unprofitable. No hard and fast rules can be laid down because of the many factors involved. With the information made available in this survey, however, landowners can study their holdings and determine the most profitable use for each acre. This decision made, the next step is to develop the land along the lines of its indicated best use. Successful farmers understand the improvement of their cultivated land and pastures, but, as a rule, they have devoted scant attention to the forested areas.

Forests and idle land make up about 60 percent of the total land area and 50 percent of the farm lands in Albemarle County. Such an area cannot be ignored. One large block on the eastern slope of the Blue Ridge is included in the Shenandoah National Park and

need not be considered further. Three sections remain, however, where large contiguous areas of steep or poor land point to the need of public ownership: (1) The group of mountains starting with the Ragged Mountains and extending in a southwesterly direction, (2) the large area of Tatum, Nason, and York soils around the southern end of the Southwestern Mountains and up the eastern side approximately to the United States Highway No. 250 (Jefferson Highway), and (3) the steep rough lands on the Southwestern Mountains.

The first area is merely an extension of a larger but similar area in Nelson County. It is too extensive to handle as farm forests and does not seem to offer enough profit to attract private capital. Its value for watershed protection and erosion control is high, and the opportunities for recreational development are so great that public ownership seems to be the logical development. Its position adjacent to the Natural Bridge division of the George Washington National Forest makes it desirable to attach it to that forest for administration.

The other two areas lie so close together that they could be managed as a unit, with the State Forest Service as the most logical agency to assume the responsibility. Here again, recreation and game production would represent a very considerable part of the return.

The rest of the forest area is broken into relatively small blocks intermingled with agricultural land. They can probably be managed most efficiently as farm forests for the threefold purpose of supplying farm requirements for fuel, building, and repair materials, supplementing the farm income through the sale of surplus products, and furnishing slack-season employment for farm labor, work animals, and equipment. In order to yield the best returns, however, the forest must be protected from fire, grazing animals, and overcutting, and be managed for sustained production.

MORPHOLOGY AND GENESIS OF SOILS

Albemarle County comprises parts of two main physiographic divisions: The Piedmont Plateau, which includes the greater part of the county, and the Blue Ridge. The county, therefore, lies in two important soil regions of the United States; the Piedmont Plateau section is in the region occupied by the Red Podzolic and Yellow Podzolic soils region, and the Blue Ridge section in the region of Gray-Brown Podzolic soils. The elevation of the county ranges from 300 feet, where the James River leaves the county, to 3,200 feet above sea level on the Blue Ridge. The relief ranges from prevailingly rolling to mountainous, and both surface and internal drainage are well established.

The soils are dominantly light in color, ranging from light gray to reddish brown and red. Some of them show evidence of laterization. The soils have developed under forest cover, mainly of deciduous trees, in a region of moderate to heavy rainfall and warm temperature, and such conditions have not been favorable for the accumulation of large quantities of organic matter. In forested areas a thin layer of leafmold covers the surface, and a small quantity of organic matter is mixed with the topmost inch or two of the surface soil; but this organic matter is soon lost through cultivation.

Active leaching of the soil continues throughout the greater part of the year, as the ground is not frozen to so great a depth nor for so long a period as it is in latitudes farther north. Because of the large amount of leaching of soluble plant nutrients from the surface soils, they do not contain so large a quantity of these elements as the subsoils. On account of leaching, calcium carbonate has not accumulated in the soil, although calcium is present in the mineral components of many of the underlying rocks. The soils of the mountainous part of the county are, for the most part, darker than those of the Piedmont Plateau, contain more organic matter, and are more friable throughout the solum. This difference is due in large measure to the climatic conditions, as the temperature is much cooler and the rainfall is slightly higher in the mountainous parts of the county. The Porters soils, therefore, have developed at much higher altitudes than, and under climatic conditions different from, those of the Cecil and Appling soils on the Piedmont Plateau.

The soils range from slightly acid to strongly acid, as shown in table 6 (p. 40), which gives the results of pH determinations on several soils from this county.

On account of the influence of relief and the action of rainfall, and as a result of the unwise use of the land by man, changes are evident in many of the soils. Through erosion and gullying, not only have the surface features been changed, but also the texture of the surface soil. In places the original surface soil has been partly removed, and in others entirely removed, leaving the clay subsoil exposed, and in some places gullies have cut to the underlying rock.

The rock formations[10] underlying the soils in this county are among the oldest in the State. They are largely crystalline, igneous, and metamorphic rocks, such as granite, gneiss, schist, diorites, or altered basic rocks, with altered sediments, such as slate, quartzite, and marble. Some of the gneisses and schist are metamorphosed igneous rocks, and some were originally beds of sand, clay, and limy muds, which have been so greatly altered by pressure and heat that they have lost their original structure. The central and greater part of the county is underlain by granite, granodiorite, and gneiss, presumably of pre-Cambrian age. Across the county along its northwestern boundary, and forming the backbone of the Blue Ridge, extends a relatively narrow belt of Catoctin greenstone, or metamorphosed basaltic lava of pre-Cambrian age; and a belt of greenstone extends across the eastern part of the county, just east of Charlottesville. Narrow belts of Loudoun slate, quartzite, and arkosic sandstone of early Cambrian age extend in a northeasterly direction through or near Alberene, Charlottesville, and Stony Point. The underlying formation in the southeastern part of the county is Wissahickon schist of pre-Cambrian age, and at the extreme southeastern corner of the county, around Glendower, red sandstone and shale of Triassic age.

The soils, in many places, bear a direct relationship in their profile development to the underlying rock formations. All the upland soils have been formed in situ through the soil-forming processes acting upon the weathered rock material. A large number of soils

[10] Information on geology of the county was furnished by William M. McGill, assistant State geologist, and Arthur A. Pagau, professor of geology, University of Virginia.

are within the county, and these differ noticeably in their physical and chemical characteristics. The soils having normally developed profiles are Cecil loam, Appling loam, Bucks silt loam, and Tatum silt loam. Many of the soils and phases do not have normally developed profiles, due to steep relief and resultant erosion. Following is a description of a profile of Cecil loam, a characteristic Red Podzolic soil, as observed in a forested area 4 miles southwest of Greenwood:

A 1. 0 to 3 inches, grayish-brown loam, containing considerable organic matter and having a thin veneer of leafmold on the surface.
A 2. 3 to 6 inches, grayish-yellow mellow and friable loam, having a slight pink or red cast in the lower part.
A 3. 6 to 9 inches, yellowish-red or reddish-yellow clay loam, which is friable and crumbly.
B 2 9 to 36 inches, bright-red stiff but moderately brittle clay. The material breaks down into irregular-shaped lumps, which, in turn, are easily crushed into a granular mass. The cut surface retains the same basic color as the broken fragments. This layer becomes slightly lighter in texture in the extreme lower part.
B 3. 36 to 44 inches, stiff but moderately brittle dull-red clay, splotched in places with brownish yellow or brown.
C. 44 to 48 inches, dull-red friable clay loam, mixed with partly decomposed granitic material.
D. 80 inches +, disintegrated and partly decomposed granitic material of yellowish red, or mingled light red, yellow, and white.

Chemical analyses of Cecil loam, which is underlain by granite, and Cecil fine sandy loam, which is underlain by arkosic sandstone, are given in table 8.

TABLE 8.—*Chemical analyses of samples*[1] *of Cecil loam and Cecil fine sandy loam from Albemarle County, Va.*

Horizon	SiO_2	Fe_2O_3	TiO_2	CaO	Al_2O_3	MgO	MnO	P_2O_5	K_2O	Na_2O	SO_3
CECIL LOAM (UNDERLAIN BY GRANITE)											
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
A	81.61	2.80	0.91	0.109	7.31	0.25	0.113	0.127	1.25	0.106	0.025
B	52.97	10.53	.90	.123	25.04	.75	.059	.459	2.41	.073	.022
C	46.41	11.63	.77	.103	31.66	.16	.030	.360	1.14	.060	.034
CECIL FINE SANDY LOAM (UNDERLAIN BY ARKOSIC SANDSTONE)											
A	82.59	2.41	0.60	0.123	7.16	0.25	0.055	0.236	1.69	0.091	0.025
B	55.19	8.92	.72	.184	24.17	.38	.020	.135	1.74	.044	.022
C	61.63	7.32	.52	.164	23.20	.40	.003	.114	2.41	.074	.020

[1] Analyses made in the laboratories of Virginia Polytechnic Institute, Blacksburg, Va.

Cecil fine sandy loam and Appling fine sandy loam, hilly phase, are underlain by and developed from the weathered products of arkosic sandstone, which resembles in many places the light-colored granitic material. It is recognized that these two soils differ essentially from the typical Cecil and Appling soils, in that the B horizon contains less silicates, and the content of quartz is greater throughout the solum, than in the typical Cecil and Appling soils. The true Appling soils are differentiated from the Cecil soils in the field mainly on the basis of the color profile.

The Porters soils, which are developed on the Blue Ridge, are characterized by brown surface soils and yellowish-brown subsoils. Both the surface soils and the subsoils are friable throughout, and

the subsoils grade into broken and disintegrated rock. The surface soils contain a larger amount of organic matter than the soils in the Piedmont Plateau part of the county.

The Davidson soils are underlain by and derived from the weathered products of dark-colored basic rocks, altered basic rocks, greenstone diorite, and amphibolite, through the soil-forming processes. Both the A and B horizons are a darker red than the corresponding horizons of the Cecil soils. The Davidson soils are higher in lime and lower in potash content than the Cecil soils.

Following is a description of a profile of Tatum silt loam as observed three-fourths mile south of Woodridge:

A_1. 0 to 3 inches, grayish-yellow smooth mellow silt loam, containing a small amount of organic matter and with a thin covering of leafmold on the surface.

A_2. 3 to 8 inches, yellowish-red heavy friable silt loam.

B_2. 8 to 26 inches, bright-red silty clay with a rather smooth feel. The material readily breaks down under slight pressure into a friable, granular mass. A cut surface shows a light-red covering. In the lower part a few small thin particles of schist are noticeable.

B_3. 26 to 40 inches, bright-red silty clay mixed with soft disintegrated and partly decomposed schist fragments, mottled with red, purple, white, and brown.

C. 40 inches +, soft, disintegrated, partly decomposed schist or shale material.

The Nason and York soils differ from the Tatum soils in the color of the soil material and the depth of the solum. York silt loam has a prevailingly thin B horizon over the soft schist and is yellow, whereas the B horizon of Nason silt loam has about the same color as the B horizon of the Appling soils. Chemical analyses of Nason silt loam and Tatum silt loam are given in table 9.

TABLE 9.—*Chemical analyses of Nason silt loam and Tatum silt loam*

Soil type	Location	Depth	SiO_2	TiO_2	Fe_2O_3	Al_2O_3	MnO	CaO
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Nason silt loam [1]	5 miles southeast of Orange, Orange County	1–10	80.48	1.71	3.56	7.42	0 06	(2)
		10–30	57.65	1.45	9.96	19.67	.03	0.14
		30–40	47.35	1.44	12.76	24.81	.03	.20
Tatum silt loam [1]	6 miles southeast of Orange, Orange County.	1–10	81.09	1.43	4.03	7.38	.06	.20
		10–30	63.57	1.30	9.06	18.04	.04	.10
		30–40	45.95	1.06	14.19	25.97	.04	.26

Soil type	Location	MgO	K_2O	Na_2O	P_2O_5	N	SO_3	Ignition loss
		Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Nason silt loam [1]	5 miles southeast of Orange, Orange County.	0.32	1.11	0.39	0 06	0.04	0.07	4.60
		.57	2.95	.02	.13	.04	.13	6.82
		.73	4.76	.02	.16	.03	.13	7.46
Tatum silt loam [1]	6 miles southeast of Orange, Orange County.	.26	1.28	.03	.06	.05	.11	4.03
		.40	1.40	.08	.07	.03	.12	6.70
		.47	2.10	.09	.10	.02	.08	9 20

[1] Silicate analyses by G. J. Hough, Bureau of Chemistry and Soils (1920).
[2] Trace.

Following is a description of a profile of Bucks silt loam as observed in a cultivated field 2 miles northeast of Warren:

A. 0 to 6 inches, reddish-brown mellow silt loam of uniform color.

B_2. 6 to 28 inches, Indian-red or purplish-red stiff brittle silty clay containing a few black specks and a few rust-brown mottles.

B_3. 28 to 36 inches, Indian-red or purplish-red silty clay. The lower part of this layer contains a few fragments of partly decomposed shale, which are very soft, are the same color as the soil material, and increase in number with depth.

C. 36 inches +, Indian-red or purplish-red soft shale of Triassic age. The color of the soil, particularly the lower part of the solum, is inherited from these shales.

The Penn soils have the same color profile as the Bucks soils, and in some places even a more intense color, owing to the influence of the parent material. The Penn soils are differentiated from the Bucks soils by the thinness of the B horizon over the parent material. All the Penn soils have a shallow solum and are developed from the Indian-red sandstones and shales of Triassic age. These soils usually occur on more rolling relief than the Bucks soils.

The Lehigh and Orange soils do not have normally developed profiles. The Lehigh soils are underlain by graphitic schist or metamorphosed shale. The Orange soils are characterized by a plastic lower B horizon and are underlain by light-colored basic rocks.

The Wickham and Altavista soils occur on second bottoms and high terraces along the larger streams of the county and have developed from beds of old alluvium. These soils have in many places a normally developed soil profile. The Congaree soils and alluvial soils (Congaree soil material) occur in the first bottoms. They are formed from recently deposited materials and are constantly being added to by the deposition of new material at each overflow of the streams.

SUMMARY

Albemarle County is one of the leading fruit-growing counties in Virginia and is widely known on account of this industry. Its famous Yellow Newtown (Albemarle Pippin) apples have gained a world-wide reputation for color and quality.

It is one of the larger counties and is situated a little northwest of the geographical center of the State. The University of Virginia is located at Charlottesville, an independent city and the county seat. The original homes of Thomas Jefferson and James Monroe, Monticello and Ash Lawn, are only a few miles southeast of this city.

The county lies mainly in the Piedmont Plateau, with elevations ranging from 300 to 800 feet, but the northwestern part includes the Blue Ridge and its eastern slopes. The relief ranges from small smooth areas to rolling and hilly in the piedmont section and steep in the mountains. The climate is temperate, with a long growing season and a plentiful and well-distributed rainfall.

Corn, hay, and small grains are the principal farm crops, and a wide variety of soils are adapted to the growing of these crops. Orchard fruits, mainly apples and peaches, are the chief cash crops, and most of these are grown in the western part of the county on the higher lying lands in the Piedmont Plateau, on the foothills, and to a less extent in the Blue Ridge, where the danger of frost is least. Poultry products rank second to fruit as a source of cash, and dairy products come third. Some cash is derived from the sale of beef cattle, hogs, sheep, grain, and hay. Corn is grown mainly for home use.

The soils are dominantly loams and clay loams in texture, with fairly friable clay loam subsoils; but along the eastern boundary of

the county is a fairly large body of soils having floury silt loam surface soils and smooth silty clay subsoils. Considerable areas of inherently good soils cannot be used for agricultural purposes, owing to their steep and unfavorable relief.

The soils are placed in three main groups: (1) soils with brown to red surface soils, (2) soils with light-gray surface soils, and (3) miscellaneous soils and land types.

The first group comprises the arable soils of the Cecil, Appling, Davidson, Bucks, Porters, Penn, Wickham, and Congaree series, which have brown to reddish-brown loam and clay loam surface soils, and brown, red, and reddish-yellow subsoils. They occur in broad continuous areas throughout all parts of the county except along the eastern edge and in the southwestern part. They constitute 53.6 percent of the total area of the county and dominate the agriculture, as the greater part of the agricultural products are produced on them.

The second group includes that body of soils in the eastern and southeastern parts having gray silty surface soils and smooth silty clay subsoils ranging in color from yellow and reddish yellow to red. They comprise the soils of the Tatum, Nason, York, Altavista, and Orange series and are considered the poorest agricultural soils in the county.

The third group comprises the soils that are for the most part so rough, steep, or stony, or so poorly drained or plastic, that their best use is for forestry.

The principal soils—Davidson clay loam, Cecil loam, Appling loam, and Bucks silt loam—are members of the first group. All these soils are leached and are relatively low in plant nutrients, but their texture, structure, and consistence is such that they are capable of being built up and maintained in a good state of fertility.

Davidson clay loam has a brownish-red to reddish-brown clay loam surface soil and a deep-red or maroon stiff but brittle subsoil. It is deeper than any other soil. It is considered to be inherently the strongest soil and is naturally higher in lime than the Cecil and Appling soils, but lower in potash.

Cecil loam has a grayish-brown loam surface soil and a red stiff but brittle clay subsoil. Appling loam differs from Cecil loam mainly in its slightly less depth and in its subsoil, which is reddish yellow and not quite so heavy as that of Cecil loam. These two soils are relatively high in potash but low in lime. Cecil loam and Appling loam are both good general-purpose soils.

The most prominent characteristic of Bucks silt loam and Penn silt loam is the Indian-red color of their subsoils, which was inherited from the underlying red shale. Bucks silt loam compares favorably with Cecil and Appling soils in productivity. It is almost level and is capable of being built up to a good state of fertility. Corn, small grains, and grass are the principal crops.

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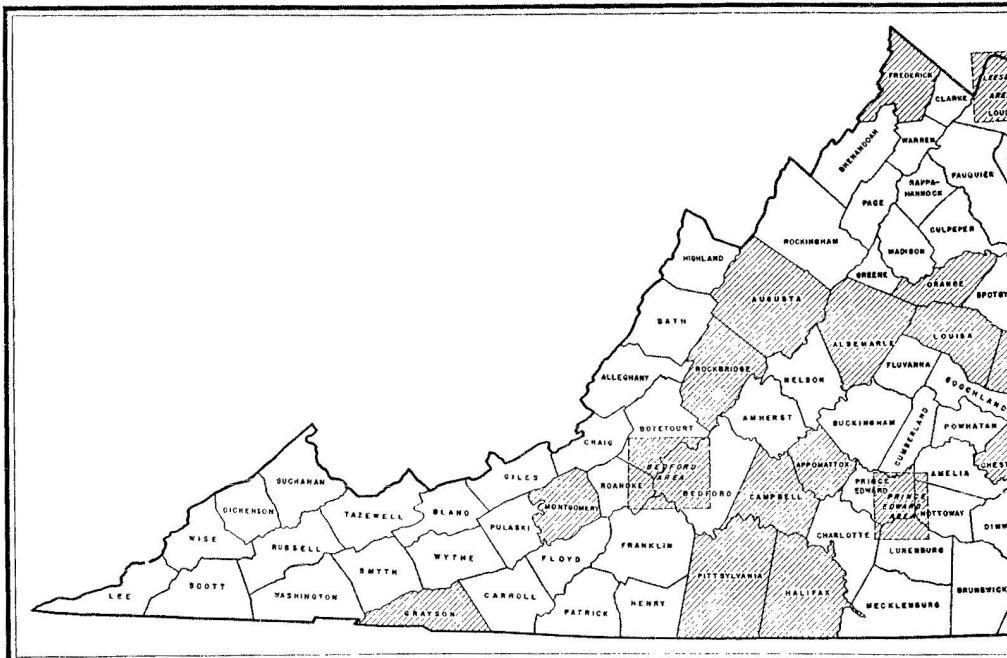

Areas surveyed in Virginia shown by shading.

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BUREAU OF CHEMISTRY AND SOILS
HENRY G. KNIGHT, CHIEF
SOIL SURVEY DIVISION, CHARLES E. KELLOGG, CHIEF

SOIL MAP
ALBEMARLE COUNTY
VIRGINIA

VIRGINIA AGRICULTURAL EXPERIMENT STATION
A. W. DRINKARD, JR., DIRECTOR
T. B. HUTCHESON, HEAD, DEPARTMENT OF AGRONOMY
S. S. OBENSHAIN, IN CHARGE SOIL SURVEY

LEGEND

Altavista silt loam — As	Cecil loam — Ce	Ce Hilly phase	Ce Steep phase	Davidson clay loam — Dc
Dc Hilly phase	Dc Steep phase	Congaree loam — Cl	Congaree silt loam — Cs	Alluvial soils, Congaree soil material — A
Nason silt loam — Ns	Ns Gravelly phase	Ns Steep phase	Orange silt loam — Os	Penn fine sandy loam — Pf
Penn silt loam — Ps	Ps Steep phase	Porters stony loam — Po	Porters loam — Pl	Tatum silt loam — Ts
Wickham fine sandy loam — Wf	Wf High, terrace phase	York gravelly silt loam — Yg	York silt loam — Ys	Rough stony land, Porters soil material — Rs
Stony colluvium, Porters soil material — Sc	Appling fine sandy loam, Hilly phase — Af	Appling loam — Al	Al Hilly phase	Al Steep phase
Bucks silt loam — Bs	Cecil fine sandy loam — Cf	Rock outcrop — R		

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort
Secondary roads and Trails
Railroads, Steam and Electric
Bridges, Ferry
R.R. crossings, Tunnel
Ford, Dam, Sawmill, Windmill
Boundary lines
School, Church, Creamery, Cemeteries
Boundary lines
Triangulation station, Boundary monument, Oil or Gas wells
U.S. Township and Section lines, Recovered corners
Forest fire station, Airway beacon, Oil or Gas tanks
Transmission line, Oil or Gas pipe line
Mine or Quarry, Rock outcrop, Made land
Soil boundaries, Stony, Gravelly and Cherty areas

RELIEF
(Printed in brown or black)

Contours, Depression contours
Prominent hills, Mountain peaks
Sand Wash, and Sand dunes
Bluff, Escarpment, Mine dumps

DRAINAGE
(Printed in blue)

Streams, Springs, Wells, Flowing wells
Lakes, Ponds, Intermittent lakes
Unsurveyed and Intermittent streams
Water-pipe lines, Canals, Ditches, Flumes
Swamp, Salt marshes
Submerged marsh, Tidal flats

The above signs are in current use on the soil maps. Variations from this image appear in some maps of earlier dates.

W. Edward Hearn, Inspector, District 2.
Soils surveyed by R. E. Devereux, in charge, and B. H. Williams, U. S. Department of Agriculture and Edward Shulkcum, Virginia Agricultural Experiment Station.

BASE MAP IN PART FROM
U. S. GEOLOGICAL SURVEY SHEETS

Scale 62500
1/2 0 1 2 3 5 Miles
1 0 1 2 3 5 Kilometers
Contour intervals 20 and 50 feet, (see diagram)

Contour Interval
20 Feet
50 Feet

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Field Operations
Bureau of Chemistry and Soils
1935